

Surgery, Gynecology and Obstetrics

An International Magazine
Published Monthly

EDITORIAL STAFF

FOR AMERICAN COLLEGE OF SURGEONS

WILLIAM J. MAYO, M.D.

GEORGE W. CRILE, M.D.

JOHN M. T. FINNEY, M.D.

WALTER W. CHIPMAN, M.D.

HARVEY CUSHING, M.D.

J. BENTLEY SQUIER, M.D.

WALLACE I. TERRY, M.D.

JOHN L. PORTER, M.D.

WILLIAM H. WILMER, M.D.

E. WYLLYS ANDREWS, M.D.

FREDERIC A. BESLEY, M.D.

WILLIAM R. CUBBINS, M.D.

GEORGE E. ARMSTRONG, M.D.

RUDOLPH MATAS, M.D.

FOR THE BRITISH EMPIRE

SIR ARTHUR MAYO ROBSON, K.B.E., C.B., C.V.O., D.Sc.

SIR BERNARD MOYNIHAN, K.C.M.G., C.B.

J. RUTHERFORD MORISON, M.B., F.R.C.S.

SIR HAROLD J. STILES, K.B.E., M.B., F.R.C.S. (Edin.)

THOMAS W. EDEN, M.D., F.R.C.S.

SIR WILLIAM DE C. WHEELER, M.D., F.R.C.S.

FRANKLIN H. MARTIN, M.D., Managing Editor

ALLEN B. KANAVEL, M.D., Associate Editor

Volume XLIII
July to December, 1926

PUBLISHED BY
THE SURGICAL PUBLISHING COMPANY OF CHICAGO
54 EAST ERIE STREET, CHICAGO
1926

S M S Medical College, Jaipur
LIBRARY,

Acc No 2787

Cl No

Date of Acc 22 11 60



COPIES SENT BY
THE SURGICAL PUBLISHING COMPANY
OF CHICAGO

CONTRIBUTORS TO VOLUME XLIII

ALBIE IRENE H	393	DICBY KENNETH H	91	FAMILY FRANK H	359
ARCE JO F	355 681	DORLAND W I NEWMAN	114	FAMSON O I	388
ARKIN YARON	153	DOUGLASS MARION	480	FASH ABRAHAM I	10 1 0
ASHLEY I BARON	312			FETRICH RENÉ	305
		LARR ROBERT FAHNETT	391	FICA WALTER I	35
BACON JOSEPH B	380	LARRAR ILLIAN K P	110	FILLIE H I	111
BALENSWICH IRVIN	604	LAY TIMPIT	366	LONG JOHN WESTLEY	61
BEER EDWIN	436	INNIS J M T JR	505		
BELTMAN RALPH BOERNT	599	LISHER DAVID	224	MASS YERUS T	5 9
BLACK CARL I	230	LOWLER I HAYNES	15	MARTIN FRANKLIN H	250 110
BLOCH EMILE	463	IRANZ K	183 302	MASON ROBERT I	10
BOORSTEIN SAMUEL W	654	IRAZHER CHARLES H	134	MASSON JAMES C	503 643
BRADY LEO	4 6			MATYS RUDOLPH	251
BROOKS CLARK D	31	CARDNER BOYD S	104	MAVERS LAURENCE H	116 746
BROWN MERLE	1 2 231 399	CARDIAN VINCENT	117	MAYO CHARLES H	1 9
	346 11 518	CORMICK RALPH K	695	MAYO WILLIAM J	46 256
BRUNN HAROLD	559	CIBRON JOHN H	1	MCACHERN JOHN D	215
BULLOCK W O	750	CODDARD TROY A	40	MCDONAL ARCHIBALD H	1 9
BUMPS HERMAN C	150	COFORTH J I	3 2	MELENEY FRANK I	338
		CITHRIP DONALD	103	MENDONÇA JOSÉ DE	195
CALDWELL CLY A	800			MEYERDING HENRY W	81
CALLAHAN WILLIAM I	124	HAIN RAYMOND FISHER	54	MIFELS FRANK M	105
CAMPBELL WILLIS C	9	HARBIN R M	515	MILLS J EARL	91
CASI JAMES T	198	HARRISON GUY K	431	MILLER NORMAN I	785
CAULK JOHN R	219	HAYS GEORGE I	401	MOORE WILLIAM JAMES	493
CHAPMAN W W	264	HENDERSON AILAIN S	15 110	MORRIS JOHN H	761
CHRISTENSEN H H	101	HENDRICKS WILLIAM A	1 9	MONIER W BLAIR	134
CIARK DWIGHT F	795	HENDRY JAMES	95	MYERSON M C	690
CLARK EDWARD D	757	HERGER CHARLES C	140		
CLINTON WILLIAM R	37	HINMAN FRANK	1	NEUSWANDER C H	169
CLOUGH I I	790	HIRSCH I SETH	659	NOVAK JIMIE	96
COBB DONNELL B	310	HUNTER GUY I	615		
COLP RALPH	627	HUNT VERNIE C	769	PEACOCK ALEXANDER HAMILTON	54
CONN H K	524			PEARL FELIX	559
COOPER JOHN ALBERT	198	IRVING W H	815	PERCE CARLTON B	459
CORBETT RUPERT S	459			PENNOCK W J	30
COUNSELLER VIRGIL S	729	JACOBS A W	50	PEREIRA I LEYNA	805
COUTTS W I	383	JONAS A F	391	PLAUT ALFRED	450
CRILL GEORGE W	6	JOPSON JOHN H	106	POICARD ALBERT	308
CROX ROLAND S	608 714	JUDIN SERGEY S	668	POLLOCK LEWIS J	415
CROWELL BOWMAN C	813			POLY ELGENE	343
CULBERTSON CAREY	713	KATE HOWARD F	389	PORTER MILES F	144
CURTIS A H	118	KENNEDY ROGER I J	903		
CURTIS GEORGE M	498	KERR J M MUNRO	85	REMYNSE J C	181
		KIRCHNER WALTER C G	164	REYTS CARMELLO	317
DANFORTH W C	713	KOCH SUMNER L	611	RITTIR ROBERT O	93
DAVIS CARL HENRY	519 544	KODAMA SHUICHI	140	ROBERTSON GEORGE	906
DEQUERVAIN I	493	KREISELMAN JOSEPH	389	ROVINE THORALD	181
DE TAKATS C	100	KURTZ ARTHUR D	488	RUSSILL R HAMILTON	141
DIVINE H B	19				

SCHILTZ FRANCES H	14	SPALDI L J A	539	VETTOR AGNES C	293
SCHMIDT FRWIN R	53	STARR W J	39	WARD A J	518
SCHMIEDEN VICTOR	89	STEIN IRVING F	118	WESON MILEY B	1
SCHREINER BERNARD F	49	STEVENS FRANKLIN A	338	WHEELER W I de C	535
SCHROEDER META I	16	STEWART GEORGE DAVID	68	WHITMAN FOSAL	221
SCOTT I A	651 116	STRAIN GEORGE T	10	WILLI A MURAT	235
SEARLS H H	291			WILLI T A	285
SIMMONS CHANNING C	377	TELINDE RICHARD W	513	WOLPER JOHN A	443
SMITH FERRIS	99	THOMAS ATRA	66	WRIGHT FREDERICA W	282
SMITH JOSEPH F	91	THORNHILL TOWNSEND W	113		
SMITH LAWRENCE WELD	10	TORGERSO WILLIAM R	38	YOUNG ARCHIBALD	823
SMITH RICHARD F	25 3 9	TOWNT E B	94		

SUBJECT INDEX TO VOLUME XLIII

ABDOMEN Method for repair of postoperative ventral hernia 388, Technique of abdominal hysterectomy for carcinoma of uterus cor 392, Importance of abdominal rigidity ed 395 Pneumatic rupture of bowel 491

Abdominal diseases Disturbed reflexes their significance in acute 806

Abnormalities Early diagnosis of anencephalus 198, Symmetrical congenital brachydactylia report of five cases 654 Absence of uterus tr 714, Hemihypertrophy 746 Atresia ani vaginalis its correction, report of case 785

Acidosis Tendency to in toxæmia of pregnancy preliminary report 38 Insulin glucose treatment of shock 224

Adenopapillomatosis gastrica Diffuse gastric polyposis report of nve proven and seven probable cases 559

Adhesions Pleural Production of artificial an experimental study 599 Ovarian dermoid rotated and fixed by omental, tr 713

Albee's method Operative treatment of ununited fracture at hip 221

Albuminuria Intradermal salt solution test in normal and toxæmic pregnancies a diagnostic and prognostic aid, 40 tr 120

American College of Surgeons—
Endowment fund 262
Clinical Congress Montreal meeting 1926 125, 401 409, 549
Hospitals of Montreal 401
Hospital standardization 262
John B. Murphy Memorial Building dedication and inauguration by the American College of Surgeons, 247, Presentation of to American College of Surgeons 249, Acceptance 251 the Athenæum of Surgery 256 John B. Murphy, Citizen and Surgeon 259 The American College of Surgeons 262 the Surgery of America 264, Three decades in surgery 268

John B. Murphy oration in surgery—Sir William MacEwen and the Glasgow School of Surgery 823
Membership 262
State and Provincial Sectional meetings 76

American Gynecological Club Tour of, summer of 1926 to Germany, Denmark Sweden Norway Scotland and England tr 710

American Society for the control of Cancer, Cancer Symposium at Lake Mohonk ed 813

Amputation stumps of lower extremities the causes and treatment of prolonged disability 524

Anæsthesia Insulin Glucose treatment of shock 724
Technique of operations for carcinoma of buccal mucous membrane, 343 Use of ethylene in obstetrics, a report of 85 cases 389 Safeties of ethylene ed 703
Local prolongation of 100, Local, exploration of the cerebellum 204 Local, ed 233, Regional Suprapubic prostatectomy for benign prostatic hypertrophy a consideration of pre-operative and postoperative management 769

Analgesia Use of ethylene in obstetrics report of 85 cases 389

Anencephaly, Early diagnosis of anencephalus 198

Aneurism Death in a pregnant woman due to a retroperitoneal rupture of a small aneurism of the splenic

artery, tr 713, of renal artery 724 of subclavian artery, ligation of first division and intrasaccular suture 764

Ankle joint Operative removal of osteoma of lower extremity of tibia 800

Anus, Atresia ani vaginalis correction report of case 78, 785

Appendectomy Technique of 103

Appendicitis, Meckel's diverticulum methods of resection with a review of thirteen cases 515, Treatment of pyelophlebitis of appendicular origin with report of three cases of ligation of the portal vein 627 Disturbed reflexes their significance in acute abdominal diseases 806

Appendix, Technique of appendectomy 103, Enterostomy its surgical importance, 372 Carcinoid tumors of the intestines 443 Treatment of pyelophlebitis of appendicular origin with report of three cases of ligation of portal vein, 627

Artery, Aneurism of renal 724 Death in a pregnant woman due to a retroperitoneal rupture of a small aneurism of the splenic, tr 713 Aneurism of subclavian ligation of first division and intrasaccular suture 764 Hernia of the superior epigastric 767

Arthritis, Streptococcus immunization of rabbits in prevention of streptococcus 176

Arthrodesis, Extra articular with autogenous bone graft ed 393

Artificial limbs Amputation stumps of lower extremities the causes and treatment of prolonged disability, 524

Ashhurst, John Jr 706

Aspiration, in the after treatment of operations of the urinary bladder, 219

Atherton Alfred Benison, 815

Atresia ani vaginalis its correction, report of a case 785

BASEDOW'S disease, Operative treatment of goiter 498
Bile duct common, The physiological significance of the gall bladder 181 Affections of the associated with jaundice, 310 Dilatation of the 729

Biliary passages Lymphatics of, 140

Biliary tract, Affections of the common bile duct associated with jaundice, 310

Bilirubin Affections of the common bile duct associated with jaundice, 310 Cholelithiasis in the negro 465

Birth injuries Intentional fracture of the humerus in the newborn, 795

Bladder The trigone of the as a factor in urinary obstruction with report of cases and discussion of operative treatment 1 Exstrophy of the 129, Aspiration in the after treatment of operations of the urinary 219
Laterality stograms a study of their clinical importance 383 Radiation of bladder tumors 392, Technique of the Mayo operation for cystocele 50, Results of X-ray therapy of malignant growths of the urinary tract 529 Parasitic fibromyomata 645, Suprapubic prostatectomy for benign prostatic hypertrophy a consideration of pre-operative and postoperative management 769

Blood The tendency to acidosis in the toxæmia of pregnancy, 38

Blood vessels Treatment of pyelophlebitis of appendicular origin, with a report of three cases of ligation of the portal vein, 627, Death in a pregnant woman due to a

- retroperitoneal rupture of a small aneurism of the splenic artery tr 713 Aneurism of the renal artery 724 Aneurism of subclavian artery ligation of first division and intrasaccular suture 764 Hernia of superior epigastric artery 767
- Bone** Iott's abscess 285 Some fundamental principles in the pathology of 308 Extra articular arthrodesis with autogenous bone graft ed 393 Roentgenograms as an aid in the diagnosis of bone tumors 812
- Bones** Lucas Champonnière and mobilization in the treatment of fractures 271 Late of the bone fragment a study of comminuted fractures 790 Operative removal of osteoma of lower extremity of tibia 800
- Bone graft** Extra articular arthrodesis with autogenous bone graft ed 393
- Bone pegs** Operative treatment of ununited fracture at the hip 225
- Bone tumors** The roentgenogram as an aid in the diagnosis of 812
- Bowel** Pneumatic rupture of the 491 Coincident cancer and melanosis of 744
- Brachial plexus** Gunshot injuries of the 415
- Brachydactylia** Symmetrical congenital report of five cases 654
- Brain** Exploration of the cerebellum 704 Traumatic pneumocephalus an analysis report of a case 750
- Breast** Concurrence of tuberculosis and cancer of report of a case 70 Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73 A two flap incision for cancer of 95
- Brown Sequard paralysis** Gunshot injuries of the brachial plexus 415
- Burns** John Sir William MacEwen and the Glasgow School of Surgery 823
- Burrell** Herbert Leslie 113
- CÆCOSTOMY** Enterostomy its surgical importance 372
- Cæsarean section** Conservative by the lower uterine segment incision 85 Cæsarean section Use of ethylene in obstetrics a report of 85 cases 389
- Calculi** Uric acid and uric stones in the kidney uric acid showers and their diagnosis 435 Calculi of the salivary glands and ducts 431 Cholelithiasis in the negro 465
- Cancer** Concurrence of tuberculosis and cancer of the breast report of a case 70 Coincident and melanosis of the bowel 744
- Capsulorhaphy** Tenosuspension for habitual dislocation of the shoulder 18
- Carcinoid tumors of the intestine** 443
- Carcinoma** Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73
- Cardiomyositis** Technique of 89
- Cerebellum** Exploration of 704
- Charcot's disease** Pathological fracture occurring in of the hip joint report of a case treated by the Whitman abduction method 66 joints in a case of syringomyelia 695
- Cheek** Technique of operations for carcinoma of the buccal mucous membrane 343
- Chicago Gynecological Society** 118 544 713
- Childbirth** Use of ethylene in obstetrics report of 85 cases 389 Critical review of five hundred consecutive deliveries 519 tr 714 Prevention and relief of prolapsus uteri 698 tr 714 Pituitrin administered at the beginning of the third stage of labor 651 tr 716
- Chloroform** Safeties of ethylene anesthesia ed 703

- Cholecystectomy** Short discourse on surgery of the gall bladder 46
- Physiological significance of the gall bladder** 181
- Cholecystitis** Lymphatics of the extrahepatic biliary passages 140
- Cholecystography** Clinical type of cholelithiasis resembling renal disease report of 2 cases 459
- Cholecystostomy** Short discourse on surgery of the gall bladder 46
- Cholelithiasis** Clinical type of resembling renal disease report of two cases 459 in the negro 465
- Cholesterol** Cholelithiasis in the negro 465
- Clasp ring** New instrument for use in intestinal anastomosis a preliminary report on new mechanical device and new method of performing intestinal anastomosis 386
- Colley's method** Enterostomy its surgical importance 372
- Colles' fracture** Lucas Champonnière and mobilization in treatment of fractures 271
- Colon** Value of enterocolostomy combined with enterostomy in acute appendicitis 61 Pneumatic rupture of the bowel 491
- Crosby** Detu 539
- Cystocele** Technique of the Mayo operation for 503 Prevention and relief of prolapsus uteri 698 tr 714
- Cystograms** Lateral a study of their clinical importance 383
- Cystostomy** Carcinoma of the prostate a clinical study of one thousand cases 150 Suprapubic prostatectomy for benign prostatic hypertrophy a consideration of the preoperative and postoperative management of patient 769
- DEBRIDEMENT** Fate of the fragment a study of comminuted fractures 790
- Dentistry** Meeting of the Seventh International Dental Congress ed 704
- Diaphragm** Closed drainage in subphrenic abscess report of two cases 215 Technique of thoracotomy with free pleura 355
- Disease carriers** Postoperative hæmolytic streptococcus wound infections and their relation to hæmolytic streptococcus carriers among the operating personnel 338
- Drainage as a factor in renal disease** 615 Intestinal fistula a method of preventing skin excoriation 701
- Dunn** James Henry 396
- Duodenum** The Finney pyloroplasty 508 Carcinoma of the small intestine report of a case of carcinoma of the ileum 757
- ECLAMPSIA** Tendency to acidosis in the toxæmia of pregnancy preliminary report 33
- Electrocoagulation** Conservative treatment of cervical erosions with 705
- Endo aneurismorrhaphy** Aneurism of subclavian artery ligation of first division and intrasaccular suture 764
- Enterocolostomy** Value of combined with enterostomy in acute peritonitis 61
- Enterostomy** Value of enterocolostomy combined with acute peritonitis 61 its surgical importance 372
- Intestinal fistula** method of preventing skin excoriation 701
- Enzymes** Intestinal fistula A method of preventing skin excoriation 701
- Epidemiology** Critical review of five hundred consecutive deliveries 519 tr 714
- Epithelioma** Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73

Ethylene Use of in obstetrics, report of 85 cases 389,
anesthesia Safeties of ed 703
Exophthalmic goiter. Operative treatment of, 408
Exostosis Suhungual 488
Lxstrophy of the bladder 19

FACI Carbuncles of Danger of infections about the
lips ed 535

Fallopian tubes Combined intra uterine and extra uterine
pregnancy with a report of two hundred seventy six
cases including two new cases observed by the author
26 Procedure for determining the patency of at
laparotomy 97

Fascia Method for repair of po toperative ventral hernia
388

Femur Arthroplasty of the hip an analysis of forty-eight
cases 9 Pathological fracture occurring in Charcot's
disease of the hip joint report of a case treated by the
Whitman method abduction 66 Technique of equalizing
leg length 93 Non union of the neck of ed 160
Flexible knee traction splint for lower limb 207 Operative
treatment of ununited fracture at the hip 221
Amputation stumps of lower extremities causes and
treatment of prolonged disability 524 Femoral osteo-
chondrosis of adolescents and sequelæ epiphyseal
separation of hip 604

Fibromyomata, Parasitic 645

Fingers Symmetrical congenital brachydactylia report of
five cases, 654

Finney pyloroplasty 508

Fractures Lucas Cbaroponnère and mobilization in treat-
ment of fractures 271 Fate of fragment study of
comminuted, 990 Intentional of humerus in newborn
795

GALL bladder Short discourse on surgery of 46 Lym-
phatics of extrahepatic biliary passages 140 Physiolog-
ical significance of 181 Affections of the common bile
duct associated with jaundice 310 Clinical type of
cholelithiasis resembling renal disease report of two
cases 459 Cholelithiasis in the negro 465, Dilatation
of the bile ducts hydrohepatosis 729

Gastric polyposis Diffuse adenopapillomatosis gastrica
report of five proven and seven probable cases 559

Gastrostomy Technique of two-stage operation for pulsion
oesophageal diverticulum 359 Technique of my
method of antethoracic oesophagoplasty 781

Gilliam operation Prevention and relief of prolapsus uteri
698, tr 714

Gingiva, Technique of operations for carcinoma of buccal
mucous membrane 343

Glasgow School of Surgery, Sir William Macewen and the
83

Glucose Insulin treatment of shock 24
Goiter Technique of partial thyroidectomy 191, Operative
treatment of 498

Greece, Medical education in ed 230

Gunshot wounds of the brachial plexus 415

Gynecology Reaction of tissues to radium in treatment of
cancer of cervix and the importance of lacerations in
producing cancer in this location 719

HÆMANGIOMA, of the uterus report of a case 28

Hæmatoma Calcified hypernephroma of the kidney re-
port of a case diagnosed by X ray examination with
a discussion of the differential diagnosis of renal
shadows 155 Essential drainage as a factor in renal
disease 615

Hand Covering of raw surfaces with particular reference to
6,7

Headaches and intranasal surgery, ed 111

Health, Pregnancy parturition, after surgical replacement
of the uterus a retrospect, 317

Heart Technique of cardiologists 89

Hemihypertrophy, 746

Hepatitis, Lymphatics of the extrahepatic biliary passages
140

Hernia femoral, principle and procedure, 147 ventral
Method for repair of postoperative 388, of the ovary
481, of superior epigastric artery, 767 Two cases of
strangulated umbilical one in baby of 15 hours 805

Hemiorrhomy, Method for repair of postoperative ventral
hernia, 388

Hip Arthroplasty of the analysis of forty-eight cases 9
Technique of equalizing leg length 93 Operative
treatment of ununited fracture at 21 Femoral osteo-
chondritis of adolescents and sequelæ epiphyseal sepa-
ration of 604 Intentional abdominal amputation in a
case of sarcoma, recovery pregnancy and birth of
living child 668

Hip joint Pathological fracture occurring in Charcot's
disease of the hip joint, report of a case treated by the
Whitman abduction method 66

Humerus Tenosuspension for habitual dislocation of the
shoulder 18 Intentional fracture of in newborn 995

Hydrocephalus Exploration of the cerebellum 04

Hydrohepatosis Dilatation of the bile ducts 729

Hypernephroma Calcified of the kidney report of a
case diagnosed by X ray examination with a discussion
of the differential diagnosis of renal shadows 155

Hydronephrosis Strictured ureter hydronephrosis a
pyonephrosis occurring in cancer of the cervix ut-
erine based on a study of 82 cases 740 Drainage as a fac-
tor in renal disease 615 Resection of stricture of the
penor renal pelvis for relief of partial 279

Hysterectomy Technique of abdominal, for carcinoma
of the uterus 185, Technique of abdominal hysterectomy
for carcinoma of the uterus 392 Technique of Mal-
operation for cystocele 503

ILEUM Meckel's diverticulum methods of resection
with a review of thirteen cases 515 Carcinoma of the
small intestine report of a case of carcinoma of 757

Ileus Value of enterocolostomy combined with enterostomy
in acute peritonitis 61

Immunization Streptococcus of rabbits in prevention of
streptococcus arthritis, 176

Infants Intentional fracture of the humerus in the newborn
795

Infections Postoperative hæmolytic streptococcus wound
infections and their relation to hæmolytic streptococcus
carriers among the operating personnel 338 Danger of
about the hips ed 535

Instruments and apparatus Pressure bags for skin graft
ing 99 Flexible knee traction splint for lower limb
201 Clasp ring a new instrument for intestinal anas-
tomosis a preliminary report on a new mechanical
device and a new method for intestinal anastomosis 386

Insulin glucose treatment of shock 224

Intentional abdominal amputation 668

International Dental Congress seventh meeting ed 704

Intestinal anastomosis Clasp ring a new instrument for
intestinal anastomosis a preliminary report on a new
mechanical device and a new method of 386

Intestines Value of enterocolostomy combined with en-
terostomy in acute peritonitis, 61 Malignant epi-
thelial neoplasms carcinoma and epithelioma occur-
ring in persons under twenty six years of age 73 Ana-
tomical basis for the study of splachnoplex 203 En-
terostomy its surgical importance, 372 Clasp ring new

- retroperitoneal rupture of a small aneurism of the splenic artery tr 713 Aneurism of the renal artery 724 Aneurism of subclavian artery ligation of first division and intrasacral suture 764 Hernia of superior epigastric artery 767
- Bone Pott's abscess 285 Some fundamental principles in the pathology of 303 Extra articular arthrodesis with autogenous bone graft ed 303 Roentgenograms as an aid in the diagnosis of bone tumors 812
- Bones Lucas Champonnière and mobilization in the treatment of fractures 271 Fate of the bone fragment a study of comminuted fractures 790 Operative removal of osteoma of lower extremity of tibia 800
- Bone graft Extra articular arthrodesis with autogenous bone graft ed 393
- Bone pegs Operative treatment of ununited fracture at the hip 221
- Bone tumors The roentgenogram as an aid in the diagnosis of 812
- Bowel Pneumatic rupture of the 491 Coincident cancer and melanosis of 744
- Brachial plexus Gunshot injuries of the 415
- Brachydactyly Symmetrical congenital report of five cases 654
- Brain Exploration of the cerebellum 204 Traumatic pneumocephalus an analysis report of a case 750
- Breast Concurrence of tuberculosis and cancer of report of a case 70 Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73 A two flap incision for cancer of 95
- Brown Sequard paralysis Gunshot injuries of the brachial plexus 415
- Burns John Sir William MacEwen and the Glasgow School of Surgery 823
- Burrell Herbert Leslie 113
- CÆCOSTOMY** Enterostomy its surgical importance 37
- Cæsarean section Conservative by the lower uterine segment incision 85 Cæsarean section Use of ethylene in obstetrics a report of 85 cases 389
- Calculi Uric acid and uratic stones in the kidney uric acid showers and their diagnosis 436 Calculi of the salivary glands and ducts 431 Cholelithiasis in the negro 465
- Cancer Concurrence of tuberculosis and cancer of the breast report of a case 70 Coincident and melanosis of the bowel 44
- Capaulorrhaphy Tenosuspension for habitual dislocation of the shoulder 18
- Carcinoid tumors of the intestine 443
- Carcinoma Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73
- Cardiolysis Technique of 89
- Cerebellum Exploitation of 204
- Charcot's disease Pathological fracture occurring in the hip joint report of a case treated by the Whitman abduction method 66 joints in a case of syringomyelia 695
- Cheek Technique of operations for carcinoma of the buccal mucous membrane 343
- Chicago Gynecological Society 118 544 713
- Childbirth Use of ethylene in obstetrics report of 85 cases 389 Critical review of five hundred consecutive deliveries 519 tr 544 Prevention and relief of prolapsus uteri 698 tr 714 Pituitrin administered at the beginning of the third stage of labor 651 tr 716
- Chloroform Safeties of ethylene anesthesia ed 793
- Cholecystectomy Short discourse on surgery of the gall bladder 46 Physiological significance of the gall bladder 181
- Cholecystitis Lymphatics of the extrahepatic biliary passages 140
- Cholecystography Clinical type of cholelithiasis resembling renal disease report of 2 cases 459
- Cholecystostomy Short discourse on surgery of the gall bladder 46
- Cholelithiasis Clinical type of resembling renal disease report of two cases 459 in the negro 465
- Cholesterol Cholelithiasis in the negro 465
- Clasp ring New instrument for use in intestinal anastomosis a preliminary report on new mechanical device and new method of performing intestinal anastomosis 386
- Colley's method Enterostomy its surgical importance 372
- Colles' fracture Lucas Champonnière and mobilization in treatment of fractures 271
- Colon Value of enterocolostomy combined with enterostomy in acute appendicitis 61 Pneumatic rupture of the bowel 491
- Crosby Dun 539
- Cystocele Technique of the Mayo operation for 503 Prevention and relief of prolapsus uteri 695 tr 714
- Cystograms Lateral a study of their clinical importance 383
- Cystostomy Carcinoma of the prostate a clinical study of one thousand cases 150 Suprapubic prostatectomy for benign prostatic hypertrophy a consideration of the preoperative and postoperative management of patient 769
- DÉBRIDEMENT** Fate of the fragment a study of comminuted fractures 790
- Dentistry Meeting of the Seventh International Dental Congress ed 704
- Diaphragm Closed drainage in subphrenic abscess report of two cases 215 Technique of thoracotomy with free pleura 355
- Disease carriers Postoperative hæmolytic streptococcus wound infections and their relation to hæmolytic streptococcus carriers among the operating personnel 338
- Drainage as a factor in renal disease 615 Intestinal fistula a method of preventing skin excoriation 701
- Dunn James Henry 396
- Duodenum The Finney pyloroplasty 503 Carcinoma of the small intestine report of a case of carcinoma of the ileum 757
- ECLAMPSIA** Tendency to acidosis in the toxæmia of pregnancy preliminary report 38
- Electrocoagulation Conservative treatment of cervical erosions with 205
- Endoaneurismorrhaphy Aneurism of subclavian artery ligation of first division and intrasacral suture 764
- Enterocolostomy Value of combined with enterostomy in acute peritonitis 61
- Enterostomy Value of enterocolostomy combined with acute peritonitis 61 its surgical importance 372
- Intestinal fistula method of preventing skin excoriation 701
- Enzymes Intestinal fistula A method of preventing skin excoriation 701
- Epsutomy Critical review of five hundred consecutive deliveries 519 tr 544
- Epithelioma Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73

Rectum Carcinoma of the and sigmoid analysis of one hundred twenty-one cases results of treatment by radiation 50 Malignant epithelial neoplasms carcinoma and epithelioma, occurring in persons under twenty six years of age 73 Pneumatic rupture of the bowel 491 Parasitic fibromyomata 645 Atresia ani vaginalis its correction report of a case 725 An unusual rectal polyp anterior sacral meningocoele 803 Reflexes Disturbed their significance in acute abdominal diseases 806 Respiration Insulin glucose treatment of shock 224 Rhizotomy Cervical for pain in carcinoma of the neck 366 Rigidity Importance of abdominal ed 393 Roentgenography Calcified hypernephroma of the kidney report of a case diagnosed by X ray examination with a discussion of the differential diagnosis of renal shadows 155 Early diagnosis of anencephalus 195 Lateral cytograms a study of their clinical importance 383 Traumatic pneumocephalus an analysis report of a case 750 Roentgenogram as an aid in the diagnosis of bone tumors 812 Roentgen ray Cancer of the mouth the results of treatment by operation and radiation study of three hundred seventy six cases observed at the Massachusetts General and Collis P Huntington Memorial Hospitals in the three year period 1918-1920 377 Roentgen therapy Carcinoma of rectum and sigmoid analysis of one hundred twenty six cases results of treatment by radiation 50 Rubin test Procedure for determining the patency of fallopian tubes at laparotomy 97

SACRUM Unusual rectal polyp anterior sacral meningocoele 803 Salivary ducts and glands Calculi of 431 Salpingectomy Pregnancy after 480 Salpinx Pregnancy after salpingectomy 483 Salt solution Intradermal salt solution test in normal and toxemic pregnancies a diagnostic and prognostic aid 40 tr 120 Sepsis Danger of about the hips ed 355 Shock Insulin glucose treatment of 214 Shoulder Tenosuspension for habitual dislocation of 18 Sigmoid Carcinoma of the rectum and analysis of one hundred and twenty-one cases results of treatment by radiation 50 Skin Intestinal fistula a method of preventing skin excoriation 91 Skin defects Technique of operations for carcinoma of the buccal mucous membrane 441 Skin flaps and grafts Covering of raw surfaces with particular reference to the hand 677 Resurse bags for skin grafting 99 Spasm visceral muscle Disturbed reflexes their significance in acute abdominal disease 806 Spinal cord Gunshot injuries of the brachial plexus 415 Spine Pott's abscess 285 Extra articular arthrodesis with autogenous bone graft ed 393 Splanchnotosis Anatomical basis for study of 293 Splint Flexible knee traction splint for lower limb 207 Spondylitis Tuberculous Pott's abscess 285 Sterility Procedure for determining the patency of fallopian tubes at laparotomy 97 Stomach Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73 Gastric resection with telescopic anastomosis cor 117 Anatomical basis for study of splanchnotosis 93 Finney pyloroplasty 508 Diffuse gastric polypoid adenopapillomatosis gastritis report of five proven seven probable cases 559

Streptococcus immunization of rabbits in prevention of streptococcus arthritis 176 Postoperative hamolytic wound infections and their relation to hamolytic streptococcus carriers among the operating personnel 338 Sturmdorf flap Amputation of the cervix with application of the principle 513 Subphrenic abscess Closed drainage in report of two cases 215 Subungual exostosis 488 Surgery The of America 264 Three decades in 263 Syringomyelia Charcot joints in a case of 693

TABES dorsalis Pathological fracture occurring in Charcot's disease of the hip joint report of a case treated by the Whitman abduction method 66 Charcot joints in a case of syringomyelia 693 Teeth Meeting of the Seventh International Dental Congress ed 704 Telescopic anastomosis Gastric resection with cor 117 Tenosuspension for habitual dislocation of the shoulder 18 Test Salt solution Intradermal in normal and toxemic pregnancies a diagnostic and prognostic aid 40 tr 120 van den Bergh Affections of the common bile duct associated with jaundice 310 van den Bergh Treatment of pyelephibitis of appendicular origin with a report of three cases of ligation of the portal vein 627 Testicle Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73 Tetraiodophenolphthalein Clinical type of cholelithiasis resembling renal disease report of a case 439 Thoracotomy Technique of with free pleura 355 Thyroid gland Malignant epithelial neoplasms carcinoma and epithelioma occurring in persons under twenty six years of age 73 Technique of partial thyroidectomy 191 Operative treatment of goiter 498 Thyroidectomy Technique of partial 191 Tibia Operative removal of osteoma of lower extremity 800 Toe Subungual exostosis 488 Toxemia Intradermal salt solution test in normal and toxemic pregnancies diagnostic and prognostic aid 40 tr 120 Tracheloplasty Amputation of the cervix with application of the Sturmdorf flap principle 513 Trachelorrhaphy Reaction of the tissues to radium in the treatment of cancer of the cervix and importance of lacerations in producing cancer in this location 719 Transactions of 50 societies— American Gynecological Club Tour of during summer of 1926 to Germany Denmark Sweden Norway Scotland and England tr 110 Chicago Gynecological Society 218 544 713 Transplantation of fascia Method for repair of postoperative ventral hernia 338 of skin Covering of raw surfaces with particular reference to operations on the hand 677 Trigonom vesice Trigone of bladder as a factor in urinary obstruction with report of cases and discussion of operative treatment 1 Trochanter Operative treatment of unilateral fracture at hip 21 Tuberculosis Concurrence of tuberculosis and cancer of the breast report of a case 70 Technique of equal leg length 93

UMBILICUS Two cases of strangulated umbilical one in a baby 15 hours old 805

- Uræmia, Suprapubic prostatectomy for benign prostatic hypertrophy, a consideration of pre-operative and postoperative management, 769
- Ureter, Trigone of the bladder as a factor in urinary obstruction with report of cases and discussion of operative treatment 1, Ureteral stricture, symptoms treatment complications, and results, a study of seventy six cases, 54, Exstrophy of the bladder 129 Iodized oil as a pyelographic medium with report of 7 cases 169 Drainage as a factor in renal disease 615, Structured, hydronephrosis and pyonephrosis occurring in cancer of the cervix uteri, based on a study of 82 cases, 730
- Ureterotomy, Ureteral stricture symptoms treatment complications, and results, a study of seventy six cases 54
- Urethra Trigone of the bladder as a factor in urinary obstruction with report of cases and discussion of operative treatment, 1
- Uric acid and uratic stones in the kidney Uric acid showers and their diagnosis, 436
- Urine Aspiration in the after treatment of operations of the urinary bladder, 219, Uric acid and uratic stones in kidney, uric acid showers and their diagnosis 436
- Uterus, Corobined intra uterine and extra uterine pregnancy with a report of two hundred seventy six cases including two new cases observed by the author 26 Conservative treatment of cervical erosions with electrocoagulation 105, Mixed cell sarcoma of the, tr 118, Technique of abdominal hysterectomy for carcinoma 185 Hemangioma of, report of a case 282 Anatomical basis for the study of splanchnoptosis 293 Pregnancy, parturition and health after surgical replacement of the uterus—a retrospect 317, Technique of abdominal hysterectomy for carcinoma of, cor 392 Relation of prognosis to histological findings in carcinoma of the cervix, 450 Results with the Watkins interposition

operation in the treatment of prolapsus uteri, 476, Amputation of the cervix with application of the Sturmdorf flap principle 513 Parasitic fibromyomata, 645, Prevention and relief of prolapsus 698 tr 714, Squamous cell cancer of cervix, tr 713, Abscess in right horn of, tr 713, Absence of, tr 714 Reaction of tissues to radium in treatment of cancer of the cervix and importance of lacerations in producing cancer in this location, 719 Structured ureter, hydronephrosis and pyonephrosis occurring in cancer of the cervix uteri based on a study of 82 cases 740

- VAGINA Parasitic fibromyomata 645, Atresia ani vaginalis, its correction, report of a case, 785 Varicocele Ivanissevich's operation for 687 Vertebra, Pott's abscess 285 Extra articular arthrodesis with autogenous bone graft ed 393 Vulva, Malignant melanoma of the vulva, with report of 3 cases 322

- WATKINS interposition operation, Results with in treatment of prolapsus uteri 476 Whitman abduction method, Pathological fracture occurring in Charcot's disease of the hip joint, report of a case treated by the 66 Wilkema method Lucas Champonnière and mobilization in the treatment of fractures 271 Witzel's method, Enterostomy, its surgical importance, 372 Wound closure Satisfactory method of difficult peritoneo neuro, 518

- X RAYS, Lateral cystograms a study of their clinical importance 383 Results of X ray therapy of malignant growths of the urinary tract, 520 X ray treatment of hypofunction of the ovary with special reference to the regulation of the menstrual function, 659

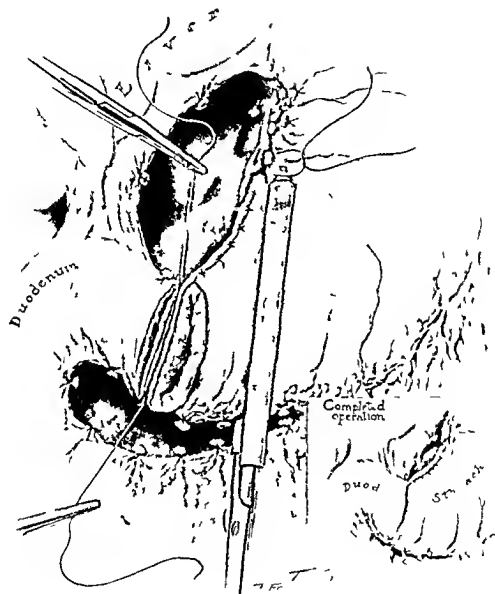
BOOK REVIEWS

- Pediatrics* vol viii Edited by ISAAC A. ANT 547
- A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis PERCIVAL BAILEY and HARVEY CUSHING 400
- Le Sinus Sphénoïdal G. CANUET and J. TERRACOL 123
- Mesenteric Vascular Occlusion Supplemented by an Appendix of 76 Original Cases A. J. COLEMAN 718
- An Introduction to the Study of X Rays and Radium HECTOR A. COLWELL 718
- Studies in Intracranial Physiology and Surgery the Third Circulation the Hypophysis the Gliomas HARVEY CUSHING 819
- The Peaks of Medical History an Outline of the Evolution of Medicine for the use of Medical Students and Practitioners CHARLES L. DANA 547
- The Melanomata their Morphology and Histogenesis JAMES W. DAWSON 238
- Surgical Anatomy of the Human Body 2d ed vol 1 JOHN B. DEEVER 718
- Injuries of the Wrist a Radiological Study The late DR. ETIENNE DESTOT Translated by F. R. H. ATKINSON 821
- Emergency Surgery the Military Surgery of World War Adapted to Civil Life GEORGE DE TARNOWSKY 819
- The Principles of Early Active Movement in Treating Fractures of Upper Extremity J. W. DOWDEN 124
- Edgar's Practice of Obstetrics for students and practitioners of medicine J. CLIFTON EDGAR Revised by ROBERT W. VAUX 6th ed 543
- Manipulative Surgery Principles and Practice A. G. FIMBRELL FISHER 240
- The Diagnosis and Treatment of Tuberculosis of the Hip G. R. GIRDLESTONE 239
- Handbook of Diseases of the Rectum 4th ed rev. LOUIS J. HIRSCHMAN 820
- Contributions to Ophthalmic Science Dedicated to Dr EDWARD JACKSON in Honor of his Seventieth Birthday By his Pupils and Colleagues in the United States 543
- Local Anesthesia in Otolaryngology and Rhinology JAMES JOSEPH KING 819
- Scoliosis Rotary Lateral Curvature of the Spine SAMUEL KLEINBERG 124
- La Chimiothérapie des Cancers SIMONE LABORDE 239
- Thérapeutique Chirurgicale P. LÉCENE and R. LERICHE vol 31 Abdomen et Organes Génito Urinaires P. LÉCENE 820
- Les Problèmes de la Physiologie normale et pathologique de l'os R. LERICHE and A. POLICARD 821
- Tumors of the Colon and Rectum Their Pathology Diagnosis and Treatment JEROME M. LYVCH and JOSEPH FELSEN 239
- Pancréatites chroniques avec Ictère (Causes Diagnostic et Traitement) valeur et résultats éloignés de la cholecystogastrotomie Preface by M. LE PROF. BÉRARD Dr PIERRE MALLET GUY 239
- The Thyroid Gland CHARLES H. MAYO and HENRY W. PLUMMER Beaumont Foundation Annual Lecture Course IV 548
- Collected Papers of the Mayo Clinic and the Mayo Foundation Edited by Mrs M. H. MELLIS H. BURTON LOGIE M.D. and CHARLOTTE E. FIGEN MANN B.A. vol xvii 819
- An Introduction to Surgery RUTHERFORD MORISON and CHARLES F. M. SAINT 2d ed 820
- Cancer of the Rectum Being the Lettsomian Lectures delivered before the Medical Society of London on February 10th March 7th and March 26th 1923 W. ERNEST MILES 238
- Abdominal and Pelvic Surgery for Practitioners RUTHERFORD MORISON 238
- Modern Methods of Amputation THOMAS G. ORR 240
- The Evolution of Orthopaedic Surgery ROBERT BAYLEY OSGOOD 240
- La Gastro-Enterostomie Technique—Indications—Dangers VICTOR PAUCHET and AUGUSTE TIERNY 547
- The Diagnosis Treatment and End Results of Tuberculous Disease of the Hip Joint GEORGE PERKINS 820
- La gastroscopie étude clinique et expérimentale JEAN RACHET 821
- Die Pathogenese des chronischen Magendarmgeschwüres nebst einigen Bemerkungen zur Frage einer Rationalen Therapie Experimentelle Studie Dr J. R. F. RUSSELL 718
- Gastric Function in Health and Disease JOHN A. RYLE 238
- L'actinotherapie nei miobromi uterini MAMELI SPINELLI 123
- Neue klinische Gesichtspunkte zur Lehre vom Asthma cardiale SIGMUND WASSERMANN 821
- Young's Practice of Urology Based on a Study of 12,500 Cases HUGH H. YOUNG and DAVID M. DAVIS with the collaboration of Franklin P. JOHNSON vols 1 and 2 400

LUKENS PICTORIAL TECHNIQUE

STOMACH SERIES

B BILLROTH I THIRD AND FOURTH STAGES



Sutures with a Reputation

Reprints of the plate may be obtained gratis by addressing

RESEARCH DIVISION C. DEWITT LUKENS CO. 4908 Laclede Ave. St. Louis U.S.A.

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XLIII

JULY, 1926

NUMBER 1

THE TRIGONE OF THE BLADDER AS A FACTOR IN URINARY OBSTRUCTION

WITH REPORT OF CASES AND DISCUSSION OF OPERATIVE TREATMENT

By FRANK HINMAN, M.D., F.A.C.S. AND MILFA B. WESSON, M.D. SAN FRANCISCO, CALIFORNIA

HYPERTROPHY of the intrureteral ridge has been long recognized as a part of the picture of changes of back pressure from urethral and vesical obstruction. The other changes in their usual order of progression are (1) trabeculation of the bladder wall with cellulæ formation and at certain favorable parts herniations to form true diverticula or sometimes a dilatation of the ureteral orifice and ureter and (2) the progressive formation of a hydro ureter and hydronephrosis, either unilaterally or bilaterally. It has been frequently shown that after relief of obstructions which have brought about some or all of these changes the diverticulum formation or the ureteral sacculations may have progressed to such degree as in themselves to keep up obstruction to urination, but that the trigonal changes can in themselves and independently do this has never been sufficiently emphasized. It will be the purpose of this paper to take up this particular phase of urinary obstruction and report a few cases in illustration, with methods of treatment.

REPORT OF AUTHORS' CASES

CASE 1. Pronounced urinary obstruction from an hypertrophied trigone with a well marked horizontal septum, completely relieved by suprapubic cystostomy with division of the trigone and removal of the septum.

H. R., aged 66 was admitted to University Hospital January 28, 1922 complaining of bladder irritation and obstruction to urination. His past history

was of interest because of the infectious fevers and the relationship between his rheumatism and dysuria. He had scarlet fever in infancy, three attacks of typhoid fever in early youth, and a severe quinsy, then a few years later a tropical fever which persisted for 3 years.

The patient suffered from nocturnal enuresis until he was 15 years old wetting the bed two or three times per night. His present illness dates from this time beginning with attacks of burning at the neck of the bladder at the inception of micturition. These attacks occurred at intervals of 4 or 5 months and were of several weeks duration. Along with the attacks was a non-inflammatory arthritis of the knees. The arthritic pain decreased toward the end of the attacks while the dysuria was accentuated. As the years passed the attacks of arthritis became more frequent involving at one time or another practically all of the joints, and the burning at onset of micturition grew gradually worse. During the period from 45 to 50 he had severe monthly attacks of lumbago. After the age of 50 the arthritic attacks decreased in frequency and severity, while the dysuria increased in intensity, and there appeared for the first time a greatly increased day and night frequency and a diminution in the size of the stream. Often it would be suddenly shut off during voiding and at all times there was an inability to empty the bladder completely at one session, he found that after apparently emptying his bladder if he walked about for a few minutes he could void about a pint.

Two years ago, because of the obstruction and foul urine, he was catheterized daily and for the past 18 months he had been catheterizing himself as often as 6 times a day. The frequency of the maneuver was to prevent voiding with the marked burning that precedes it. There was no history of venereal diseases except one uncomplicated attack of gonorrhea at the age of 16. He had lost 80 pounds in weight and had been unable to work for several

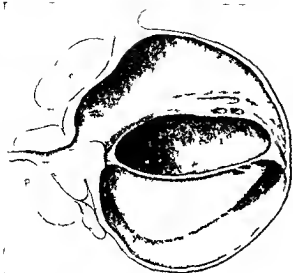


Fig 1 Diagrammatic representation of the hypertrophy of the interureteral ridge and the pronounced septum dividing the marked pouch formation behind in Case 1. The ureters lie quite high on the ridge and Bell's muscles evidently have been stretched and elongated

years. He had been treated in various clinics and a cystoscopic diagnosis of diverticula of the bladder had been made.

Examination. A few small external hemorrhoids were present; the anal sphincter was of good tone. The prostate was slightly larger than normal; the right lobe was globular on deep palpation; areas of induration were felt throughout; most marked along the periphery; dense adhesions were present; the right seminal vesicle was thickened and drawn downward and outward by adhesions. The median furrow was broad and shallow; the median notch palpable. The left lobe of the prostate and seminal vesicle were similar to the right. There was a very slight intravesicular thickening. The membranous urethra was negative.

The prostatic secretion contained 100 white blood cells to the high dry field. The kidney function test (phenolsulphonaphthalein) for 2 hours was 32 per cent (22 per cent and 10 per cent).

Cystoscopy revealed a residual urine of 950 cubic centimeters. The lateral prostatic lobes were not intravesically hypertrophied but there was the appearance of a small median bar. The bladder was moderately trabeculated and a few deep cellules were present. The trigone was markedly hypertrophied having very prominent plica ureterica and a cord like interureteric ridge that lay close against the median bar. Running from the ligamentum interuretericum and dividing the bladder almost into equal halves was a well marked septum (Fig 1). With a finger in the rectum and the cystoscope in the bladder the operator by rotating the instrument could feel the beak strike against the septum and upon withdrawing it found a definite thickening

present at the vesical orifice over which the beak jumped.

Preliminary to admission to the hospital for operation the patient continued to catheterize himself and used bladder irrigations of a 1:1000 solution of mercurochrome 220. Plain tap water from a hydrant was used in place of boiled water with the result that during catheterization at the clinic a large hydrobatida dyed with mercurochrome was withdrawn from his bladder.

Operation and results. February 9, 1922 under nitrous oxide oxygen and ether anesthesia a suprapubic cystostomy with division of the trigone and removal of anomalous septum was performed (Himman). When the bladder was opened and retracted on each side with a stay suture the trigone stood out as a prominent ridge with a deep pouch in front of it and with a subtrigonal septum passing backward in the midline behind it (Fig 1). The trigone was about 8 millimeters thick and the interureteric ridge was about 8 centimeters long; the ureters being about 4 centimeters apart. The anteroposterior subtrigonal septum was about 5 millimeters thick. The two pouches completely undermined the trigone to the level of the prostatic orifice from which they were separated by about 5 millimeters of muscle and mucous membrane. The septum was removed with scissors; then the ureters having been located by means of a probe a section triangular in shape with the apex toward the vesical neck was cut from the trigone (Fig 2) and the cut edges brought together by interrupted sutures. In order to eradicate the pouch posterior to the trigone the bladder wall in that region was raised as a longitudinal ridge by means of thumb forceps and interrupted sutures passed through from one side to the other at its base; the tissue above the level of the row of sutures was then excised and the mucosa approximated by a continuous suture (Fig 3). No definite obstruction was found at the vesical neck but a transvesical punch operation was done with a scalpel and the hemorrhage stopped with the electric cautery. A urethral catheter was left in place and a suprapubic drainage tube in the upper end of the incision. The patient had a stormy convalescence due to bronchopneumonia and epididymitis but the suprapubic fistula healed in 32 days.

April 5, 1922 Cystoscopy showed no evidence of the previous location of the septum. The internal sphincter was slightly relaxed. Nodules and tags in the posterior urethra were fulgurated.

April 10, 1922 The patient voided fairly well; had some frequency; the residual urine varied from 200 to 400 cubic centimeters. A Kollmann dilator #36 F was tolerated with ease; the general condition was excellent and he was discharged from the hospital.

July 11, 1922 The general health was excellent; there was no dysuria; no frequency; no nycturia; he voided about 8 ounces on arising and about 20 minutes later an equal amount; the bladder then felt empty and there was no desire to void for about 6 hours. The patient had twice catheterized himself

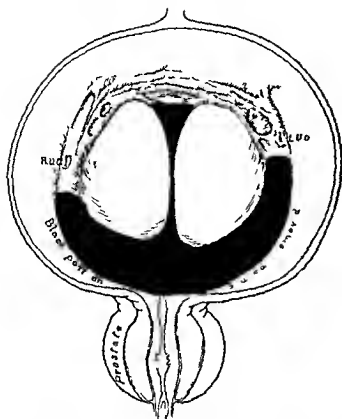


Fig 2 Diagrammatic representation of the operation performed in Case 1 in which the hypertrophied ridge and septum were radically removed leaving a denuded area as shown in this diagram.

after voiding to make sure that there was no residual and had found none. At this examination a residual of 20 cubic centimeters of infected urine was found.

September 14, 1922 The patient reported a general improvement considering himself cured, and had become self supporting for the first time in years. The bladder capacity was 400 cubic centimeters and residual urine was 4 cubic centimeters.

June 3, 1925 There was no nocturia daily, frequency was 4x. Cystoscopy (Wesson) Bladder capacity was 400 cubic centimeters, residual urine of the trigone was narrower than normal being pulled close to the vesical orifice so that the ligamentum interuretericum was concave. There was no band and practically no scar from the operation. The vesical orifice was normal and with the finger in the rectum and the cystoscope in the urethra there was no evidence of thickening.

Since the age of 15 this patient had complained of dysuria associated with attacks of arthritis and for the 2 years preceding operation had led a catheter life. A plastic operation was done upon the trigone, removing an anomalous septum, obliterating the pouch, and restoring the trigone and the base of the bladder to normal. During the interval of 3 years following operation, he had been kept

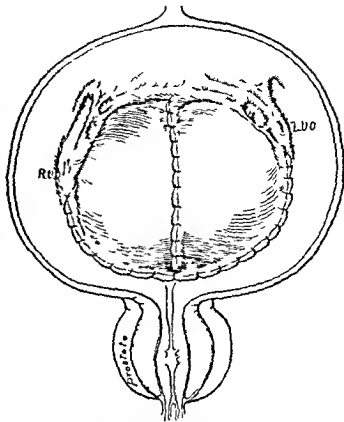


Fig 3 Represents the edges of the denuded area brought together by continuous blocked suture restoring the base of the bladder to practically normal configuration. It is seen that the ureters still lie quite high and yet there is apparently enough muscle left in the trigone to pull open the neck as urination has been normally re-established.

under observation and there had been no return of any symptoms.

CASE 2 Hypertrophied trigone with small bar and relief by use of Kohlmann dilator.

C R D 51 years of age was first seen October 10, 1922 (Wesson). His physician was searching for a focus of infection that caused exacerbations of gastric symptoms and the necessity of a genito-urinary tract investigation was indicated because of nocturia. He gave a history of gastric disturbances extending over many years and had been treated at famous clinics in various parts of the world. A cholecystectomy was done in 1914 (without any relief) and various operations had been advised since that time. However since his gastric symptoms appeared to parallel his general physical condition his last physician was interested in the eradication of foci of infection rather than in subjecting him to more surgery.

Genito-urinary history. Between the ages of 21 and 30 he had three uncomplicated attacks of gonorrhea. At 33 he had a severe left epididymitis with out any apparent cause. The urinary history was interesting in that throughout his life he had had nocturia, formerly he had to void once per night but for the past 15 months, twice. He thought that this increased frequency was due to the occurrence

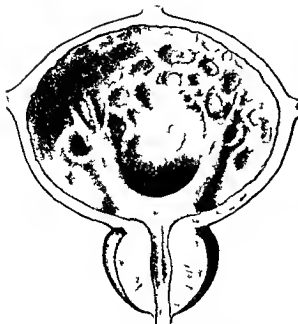


Fig. 4. Drawing to represent the hypertrophied interureteric ridge in Case 2. The ridge is brought in close apposition to the neck and there is quite a deep pouch behind and Bell's muscles again are quite elongated. Relieved by Kollmann dilatations which have had to be repeated periodically.

of marked priapism which was associated with attacks of gastric disturbance. The daily frequency was 4x with no hesitancy and no dribbling but there was a slight dysuria burning being present before and during urination. The patient's sexual life had always been active but he had never indulged to excess.

Examination. Urine was voided in three glasses and all were cloudy with phosphates. The chemical examination was negative. The second glass was centrifuged and stained smears showed no pus or organisms.

External genitalia. The penis was negative except for a partial absence of foreskin due to a crude circumcision the juncture of the mucous membrane and skin occurring about one inch above the coronary sulcus. The left epididymis was indurated.

Rectal examination. No external hemorrhoids. Anal sphincter of good tone. Prostate broad and flat. Indurated nodules felt throughout median furrow. Palpable seminal vesicles pulled downward and outward by adhesions. No intervacular plateau of induration. Expressed secretion contained 100 pus cells, much lecithin and many motile spermatozoa to the 1/6 field.

Cystoscopy. A Brown Buerger anterior cystoscope passed with ease and 20 cubic centimeters of residual urine was found. The bladder capacity was 400 cubic centimeters. The bladder wall was trabeculated, the mucous membrane appeared normal and no tumors

stones or other foreign bodies were seen. The interureteric ridge was pulled close against the vesical orifice as a narrow shelf with a deep pouch behind the bottom of which could not be seen (Fig. 4). Lateral to each plica ureterica was a large cellule and in the base of the bladder was a smaller one that simulated a diverticulum but was only 1 centimeter deep. Dense bands appeared to act as guy ropes for the plica ureterica. A study of the vesical orifice showed merely a suggestion of lateral clefts. With cystoscope in urethra and finger in rectum the beak could be felt as it struck the trigone but there was practically no jump as it passed through the vesical orifice. A posterior cystoscope was then used and the findings were the same: the bottom of the bas-fond not being visible with it.

Treatment consisting of dilatation with a Kollmann dilator was instituted. The dysuria disappeared following cauterization of the posterior urethra through an endoscope.

June 1 1923. Cystoscopy. The trigone appeared less like a high shell for the bas-fond was comparatively shallow and the bottom could be seen. Residual urine was 15 cubic centimeters.

June 16 1925. During the past 2 years the residual urine had varied from 75 to 5 cubic centimeters. Nocturia was no longer a disturbing factor. The patient retired at 9:30 p.m. and arose at 6:00 a.m. without having to void in the interim.

The etiology of the pronounced hypertrophy of the interureteric ridge in this case is open to discussion. The most likely cause is a long continued mild obstruction from a small fibrous contracture of the neck secondary to his many attacks of gonorrhea. His history of prolonged frequency would give plenty of opportunity for an hypertrophy of the trigone. The chronic posterior urethral irritation is doubtless also a factor of this frequency. The hypertrophied trigone has finally become more of an obstruction than the contracture of the neck and such trigones as this require care in case a bar is attacked by a punch operation as the hypertrophied ridge comes into such close apposition to the neck that it would be extremely difficult to keep it from being caught in the punch instrument. No doubt deep punches at the neck laterally and anteriorly in such cases might be indicated. The urinary disturbance is of such a mild nature and so completely relieved by the dilatations that operation so far has not seemed justifiable.

CASE 3. Large ureteral stone in the intramural portion producing prolonged trigonal irritation leading to hypertrophy and symptoms of infravesical

obstruction. Complete relief followed simple removal of the stone.

C A O, aged 60, was admitted to University Hospital, October 18, 1921, with a rather unusual history of periodic attacks of difficulty of urination of one year's duration, accompanied by severe pain either suprapubic or in the right groin, radiating to the hip and back and lasting 6 to 7 hours. During the intervals there was no dysuria and the stream was of good size and force. The history otherwise was not of interest.

Examination. The prostate was found on rectal palpation to be slightly enlarged with a partial obliteration of furrows and notch. But cystoscopy revealed a residual of 25 cubic centimeters only and no evidence in the presence of sulci or notches, of an intravesical prostatic hyperplasia. The bladder wall was trabeculated and there was an hypertrophy of the trigone which was narrowed and the interureteral ridge lay close against the vesical orifice in such a way as obviously to obstruct it. The ligamentum interuretericum was concave and definitely elevated, standing up like a distinct bar across the floor of the bladder which ballooned out into a large relaxed cavity just behind the ridge. There was a relaxation of the vesical orifice sufficient to allow the cystoscope to be drawn into the posterior urethra and a good view obtained as in an early tabetic bladder. The blood Wassermann was negative as was the spinal fluid. A stone was found in the intramural portion of the right ureter and was removed by manipulative procedures. There has been no recurrence of symptoms.

Frequency of urination and periodic difficulty are in this case secondary to the prolapsed ureteral end with stone in it, and the marked hypertrophy of the interureteral ridge and foreshortening of the trigone have in some way resulted from this complex.

CASE 4. Median bar of long standing which has led to marked atony of the bladder and shows the early change of sacculation from back pressure above the trigone.

B L, aged 78, referred by Dr George Ebricht complained of pyuria. He had ulcers of the stomach 44 years ago and lived for over 9 years on nothing but milk. During the last 5 years he has had trouble some arthritis. Nine years ago he had gastroenterostomy performed. There had been no urinary symptoms until about 5 years ago when he began to have frequency with nocturia of variable degree with burning and pain on urination at the time of greatest severity and at times there has been a noticeable difficulty in urination. He has never passed a stone, has never noticed any blood in the urine and it has only been within the last few months that there has been pus. It was on account of the finding of pus that he was prepared for urological study.

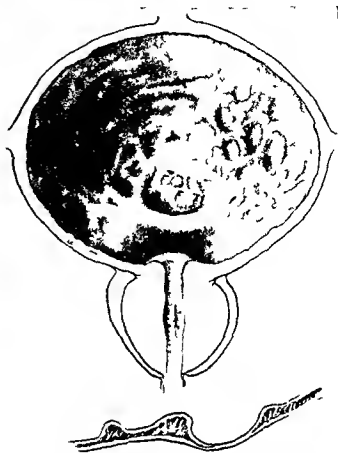


Fig. 5. An early hypertrophy of the interureteral ridge with pouch formation behind accompanying a median bar in a man 78 years of age. The diagram inadequately represents the marked vesical atony.

The urine was slightly cloudy and showed microscopically 8 to 10 pus cells with rare motile rod. The phthalein test without a catheter was 7 per cent the first hour and 3 per cent the second. Upon catheterization a residual of 900 cubic centimeters was found and after the use of a retention catheter the phthalein increased to 40 to 50 per cent in 2 hours. The prostate was not enlarged, the furrow and notch were present and well marked and there was no pronounced induration. The cystoscopic examination showed mild catarrhal inflammatory condition of the bladder wall with fine trabeculations which were most marked posteriorly but there were no deep celluloses nor any suspicion of the orifice of a diverticulum. There was no stone or tumor present. The bladder was markedly atonic, holding without any discomfort 1,300 cubic centimeters. The ureteral orifices were on an hypertrophied ridge and the interureteral ridge stood up as a pronounced bar behind which was a rounded depressed area as shown in Figure 5, which was about 5 millimeters deep with fine trabeculations at its base. The interureteral bar was well above the vesical neck and the sacculation behind it was not deep enough to warrant the assumption that it produced obstruction. The bladder neck was not relaxed and careful inspection showed no

sulci nor notches but posteriorly there was a definite median bar with a deep bas fond between it and the hypertrophied interureteral ridge. Recto urethral palpation showed no prostatic thickening but the beak of the cystoscope could be felt distinctly to slip over this bar at the neck.

A punch operation was performed but on account of the vesical atony urination was not immediately restored to normal and 2 weeks afterward the residual persisted at between 250 and 350 cubic centimeters necessitating catheterization at regular intervals in order to restore the bladder tone by preventing overdistention.

This case is an example of beginning sacculatation back of an hypertrophied interureteral ridge. It is interesting that the principal changes of back pressure are the vesical distention and renal insufficiency. The hypertrophic changes in view of the chronic obstruction and its degree are mild but at the time before decompensation were no doubt marked. It seems reasonable to expect that with restoration of bladder tone the hypertrophied interureteral ridge and sacculatation back of it will largely disappear and will not become a factor of obstruction.

These few cases illustrate progressive changes of the trigone with infravesical obstructions and an understanding of the structure and function of the trigone explains these abnormalities that produce disturbances of urination.

ANATOMY AND PHYSIOLOGY

Anatomically the trigone has long been known to be an independent structure of the bladder. Embryologists tell us that it is probably mesodermal in origin whereas the rest of the bladder is endodermal since apparently the trigone is formed by an unfolding of the ureters and the Wolffian ducts whereas the bladder proper is formed from the allantois. But the muscles of the trigone are developed by an extension from the urethra (Kalischer) or, which seems much the more probable explanation, from the ureters (Bell). Many years ago Bell gave a very accurate description of the manner in which the muscles of the ureter extend down into the posterior urethra in a fan like way to form what we now call the trigone of the bladder. This gives rise to the lateral ridges which are known as Bell's muscles and it has been shown by anatomists that

the trigonal muscle can be cleanly dissected off of the circular and longitudinal coats of the bladder beneath. The true relation of this muscle entity to micturition was never fully appreciated until the more recent clinical studies of Young and Wesson who have been able accurately to infer the function of the trigone by observing it during the act of urination through the cystoscope and endoscope urethrally and by examining bladders which had a suprapubic opening the cystoscope being passed through this and the neck of the bladder observed during the act of urination.

These observations seem to show that the trigone pulls open the neck in an active manner and this conclusion has been confirmed by the anatomical and pharmacological studies of Wesson and Macht. The internal sphincter is not a circular sphincter in any way at all comparable to the anal sphincter. The neck of the bladder when closed forms a more or less semicircular slit the convex portion being formed by the confluence of the trigonal muscles as they pass through to their attachment near the verumontanum forming what is known anatomically as the uvula of the bladder. The exact correlation in function during micturition of the detrusor vesicæ (the muscular coats of the bladder proper), trigonal muscle and the so called internal and external sphincters is as yet not thoroughly explained. The trigone from observations after certain spinal cord injuries and from the pharmacological studies of Macht, seems to have an independent innervation to that of the detrusor vesicæ and the internal sphincter but as has been frequently demonstrated by clinical studies and cystography, the internal sphincter though made up of smooth muscles is not in a strict sense an involuntary muscle but is capable of giving voluntary control of urination even with complete destruction of the external sphincter. The clinical aspects of this question have been thoroughly reviewed by Cecil. The principal innervation of the trigone is apparently by true sympathetic fibers derived from the third and fourth lumbar segments by way of the vesical plexus whereas the detrusor vesicæ is innervated by

parasympathetic fibres largely through the nervus erigens from the second and third sacral segments. It will be seen from the above anatomical and physiological consideration that the trigone is a true structural entity which plays an active and important part in the act of micturition.

PATHOLOGY

So far as our search of the literature and personal experience goes congenital malformation of the trigone per se has never been described. Malformations are of course noted but always in conjunction with malformations of the urethra or ureters to which the abnormality of the trigone seems definitely to be secondary. This would lead to the supposition that whereas the trigone appears to be an entity anatomically, this appearance is not borne out in fact the intimate relation of the trigone in development to the ureters accounting for failure to find any marked frequency of congenital abnormality of the trigone alone. That the trigone can undergo frequent required or secondary abnormalities is well known to all cystoscopists. The common change from the normal is associated with inflammatory shortening of one or both ureters. It is a frequent observation in unilateral renal tuberculosis, for instance to find the trigone pulled well over to the diseased side so that the healthy ureteral orifice will lie almost in the midline of the bladder and the diseased ureter be higher and well over to the lateral side and this type of distortion may be quite variable. Another frequent change is either a markedly foreshortened or lengthened trigone, the ureters in the first instance being in close apposition to the neck of the bladder and in the second being high up on the posterior walls so that the trigone is drawn out into a long Y-shaped structure, or even like the letter V. A third change, which is what this paper is mostly concerned with, is an hypertrophy of the interureteral ridge or Mercier's bar which can be present either with a foreshortened or an elongated trigone, and a fourth change is one that is always apparently associated with an ulcerative type of infection in which the trigone has been dissected up

beneath the interureteral ridge so as to result in the undermined or dissected type of trigone.

It is in the case of the hypertrophied end of the dissected trigone that one would expect the trigone in itself to lead to obstruction to urination. O. Mercier has recently described cases of hypertrophied bar which give the characteristic symptom of intermittency in urination, as is sometimes seen with diverticulum of the bladder. Whether the trigone is foreshortened or lengthened would seem to depend upon the relative association of obstruction and infection in its causation. The foreshortened hypertrophied trigones which we have seen give the impression that they have been long associated with an infection plus obstruction whereas the lengthened non-hypertrophied trigones clinically appear to have been largely associated with infection only. In those cases of spinal cord lesions associated with hypertrophies of the interureteral ridge the trigone is most frequently elongated, but even in some cases of apparent marked elongation the bar can come during micturition in apposition to the neck to produce obstruction. Conclusions from cystoscopic observations must be guarded because of the great variability in the cystoscopic pictures according to the degree of relaxation or tonicity of the different parts of the bladder at the time of cystoscopic study. An interureteral ridge which at one time seems to be well above the neck will be seen under certain conditions of voluntary strain on the part of the patient to rise up and approach the neck, more as though it were pushed down by the fluid above than as if it were pulled down by its own muscles, at another time with relaxation from appearing to be definitely obstructive it is seen to recede flatten out, and largely disappear. Judging from structure one would expect the pull of contraction of the trigone to come largely on the ureteral ridges or Bell's muscles rather than on the interureteral ridge whose fibres attach themselves on the respective ureteral bands. These facts are significant relative to the preponderance of diverticula in the region of the ureteral orifices and their great rarity in the region above the interureteral ridge.

CLASSIFICATION OF TRIGONAL ABNORMALITIES CAUSING URINARY DISTURBANCE

The abnormalities of the trigone that lead to disturbances of urination which may require direct treatment are rare. For practical purposes they may be classified as

- 1 Congenital¹
- 2 Hypertrophy of the interureteral ridge
 - a With foreshortening of the trigone
 - b With elongation of the trigone
 - c With or without pouch formation or herniation of bladder wall above
 - d Associated with vesical diverticulum
- 3 Distortion of the trigonal landmarks
 - a By urethral changes
 - b By ureteral changes
 - 1 Unilateral
 - 2 Bilateral
- 4 The dissected or ulceratively undermined trigone
 - a Obstructive
 - b Non obstructive

TREATMENT

Some of these cases of interureteral ridge hypertrophy simulate closely the condition of median bar or contracture of the vesical neck. Undoubtedly the same type of treatment might effect a cure but the danger of hemorrhage following the punch operation on the trigone is too great. In case obstruction is kept up by an hypertrophied interureteral ridge the best method of attack is suprapubic cystotomy and the direct application of the procedure best suited to correct the abnormality. In Case 1 it was possible to resect the hypertrophied ridge and completely dissect out the septum and redundant floor of the supratrigonal pouch and then reunite the edges of the trigonal muscle directly on the bladder wall beneath so as to restore to almost normal configuration the base of the bladder. Care should be taken not to remove so much of the trigonal muscle as to endanger its functional activity. A number of operations on hypertrophied interureteral ridges have been reported by Pasquereau and Deton in whose cases the ridges were in close apposition to the vesical orifice acting as bridges or dams, and were treated by simple incision

We have a case of this type

This allowed the ends to pull well apart and thus connected "the bas fond with the neck of the bladder by a deep gutter" with cure. Hemorrhage was a troublesome complication. Blanc reported a similar case treated in the same manner in which however the ridges reformed within a year, and Young and Wesson have recently reported a series of cases of urinary obstruction due to hypertrophy of the interureteral ridge that were cured by splitting the trigonal muscle. Whether the supratrigonal pouch is resected and a plastic applied to restore the base of the bladder as in Case 1 or the obstructing ridge is simply incised careful control of hemorrhage in either case is required.

CONCLUSION

- 1 Hypertrophy of the interureteral ridge may result from chronic vesical irritation from mild types of vesical or infravesical obstruction or from both in combination.
- 2 Hypertrophies of the interureteral ridge may be of a type and in a position to produce in themselves obstruction to urination.
- 3 An obstructing interureteral bar or ridge is always an acquired condition though the cause may be congenital.
- 4 An obstructing interureteral ridge may also result from chronic ulceration usually tuberculous which has led to a dissected or undermined trigone.
- 5 Marked obstruction from an hypertrophied ridge seems to be due principally to the hydrostatic undermining of the trigone back of it, a position practically immune to the formation of diverticula.
- 6 The treatment of an obstructing interureteral ridge is surgical by suprapubic cystotomy and (1) either incision of the ridge with suture and ligature of the incised edges to control hemorrhage or (2) resection of the ridge and the supratrigonal pouch with restoration of the base of the bladder which is the preferable method when these pouches are deep.
- 7 Before operation for an hypertrophied interureteral ridge, in case it has been secondary to obstruction the primary obstruction should first be removed and a period of time allowed to elapse so that it may be seen

whether the removal of the original obstruction will not cause a disappearance of the interureteric hypertrophy

REFERENCES

- BELL, SIR CHARLES. Account of the muscles of the ureters and their effects on the irritable state of the bladder. *Med Chir Tr*, Lond 1812, III 171-190
- BLANC H. A propos de la barre interurétrale. *J d urol* 1923 XVI 274-285
- CECIL A B. The mechanism of urination. *J Am M Ass* 1915 LV 1436-1440
- DETON W. Barre interurétrale, cause principale d'une retention complete operation amputation. *J d urol* 1915 IV 37-240
- KALISCHER O. Die Urogenital muskulatur des Dammes. *Berlin S Karger* 1902
- PASQUEREAU. Barre vesicale interurétrale. *Ann d mal org genito urin* 1911, XXI, 2010-2011
- WESSON M B. Anatomical, embryological and physiological studies of the trigone and neck of the bladder. *J Urol* 1920 IV 279-315
- YOUNG H H. Changes in trigone due to tuberculosis of kidney ureter and bladder. Bridge formation and floating trigone. *Surg Gynec & Obst* 1918 XXVI 658-615
- YOUNG H H and MACINT D I. A contribution to the physiology and pharmacology of the trigonum vesicae. *J Pharmacol & Exper Therap* 19 3 VII 329-354
- YOUNG H H and WESSON, M B. The anatomy and surgery of the trigon. *Arch Surg* 1911 III 1-13

ARTHROPLASTY OF THE HIP

AN ANALYSIS OF FORTY EIGHT CASES¹

By WILLIS C. CAMPBELL, MD FACS, MEMPHIS TENN SEEL

THE value of operations for the mobilization of ankylosed joints cannot be estimated for all joints collectively, for the technique in different joints varies, as does the anatomy and mechanical action so that each joint presents its own peculiar problem. Arthroplasty of the hip joint has been considered in former contributions and by others, but usually it has been discussed in conjunction with similar procedures in other joints and in a rather general manner.

As the number of patients operated upon for the mobilization of an ankylosed hip joint reported by any one surgeon is relatively small, we have selected as a basis of discussion an analysis of 48 arthroplasties of this joint.

The first surgical procedure for ankylosis of a joint was described in 1826, by Dr John Rhea Barton, of Philadelphia. Dr Barton induced a pseudo arthrosis in the neck of the femur with good functional result. This in no manner resembles the operation employed at the present time known as "arthroplasty," which is a well defined surgical procedure, the object of which is not alone the reconstruction of the articular surfaces and the prevention of osseous fusion, but the reconstruction of all the component parts of a joint as capsule, ligaments, tendons etc., to permit free motion. A special routine after treatment is so essential that it cannot be dissociated from

the operation. However no combined operation and after-treatment can restore a joint to the same degree of efficiency as has a normal joint, though a successful arthroplasty does secure a joint which has strength stability and durability, and is without pain or tenderness. Arthroplasty must not be confused with "excision" which is merely the resection of sufficient bone at the site of the former joint to induce pseudo arthrosis with little regard for stability.

Several European surgeons reported a small number of arthroplasties of the hip prior to 1900, but about that time Murphy perfected and standardized the operative technique, and since then there has been no radical deviation. Undoubtedly Murphy's untiring efforts gave impetus to the progress which has since been made in this field, and to him full credit should be given.

Two types of intra articular or true ankylosis are described, the fibrous and the bony types. In reality, these differ only in degree and not in kind. The roentgenogram cannot be depended upon to differentiate the two types unless well organized and very dense osseous fusion is present. However, this is not essential, as the treatment and prognosis are the same in both types. Except as a complication, periarthritic or false ankylosis is not pertinent to the subject.

¹ Read before the Southern Surgical Association, Louisville, Kentucky, December 18, 1925.



Fig. 1. Roentgenogram 10 years after arthroplasty of hip showing proliferative changes to be expected as a reaction following such an extensive procedure on bone.

When ankylosis of the hip joint occurs with the leg in the most serviceable position, i.e., with flexion at 90 degrees, abduction at 15 degrees and rotation neutral, walking is often possible by means of compensatory motion of the lumbar spine, and the patient has only a negligible limp and normal endurance. However, there is much inconvenience and discomfort when he sits or stoops, for instance, when he puts on his shoes, and it is for this that he seeks relief. In a large percentage the disability is far greater when ankylosis occurs with the leg in malposition, as in flexion with abduction and external rotation, or in flexion with adduction and internal rotation.

The scope of arthroplasty of the hip joint is wide, but it must not be employed indiscriminately. Due consideration to occupation and financial status of the patient must be taken into consideration, as much time may be required to obtain a durable joint, which, after all, may not fulfill the requirements of the patient.

The preferable age at which arthroplasty should be done is between 18 and 30, as during this period rehabilitation is possible through vocational training if a change of occupation is necessary. In children, arthroplasty of the

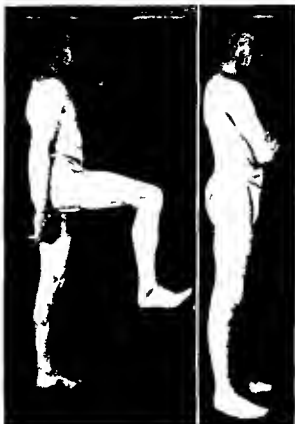


Fig. 1 a. Ninety degrees flexion with practically normal function 10 years after arthroplasty of hip.

Fig. 1 b. Complete extension 10 years after arthroplasty of hip.

hip is not warranted, as it may produce epiphyseal injury, and as the co-operation of the patient in the after-treatment usually cannot be secured. There should be no arbitrary upward age limit, for age is not always a question of years. As a rule, however, the chances of success are less when the patient is over 45. On the other hand, so few will submit to operations of this type, even at the age of 40, that no positive assertions can be made.

There are comparatively fewer contraindications to arthroplasty of the hip than to arthroplasty of other joints. The contraindications may be enumerated as follows:

1. **Tuberculosis.** In no one hip in which tuberculosis is the causative agent of ankylosis should the joint region be entered for the purpose of mobilization, as the probability of "lighting up" latent infection is well known. However, in the presence of ankylosis of both



Fig 1 a One year and 6 months after arthroplasty of hip. About 75 per cent normal movement in all directions

hips, a condition which is obviously so disabling as to warrant any procedure which offers even a fair chance of success, this undue risk is justifiable

2 Old dense, eburnated bone, the result of an extensive osteomyelitis. Such material is usually not satisfactory matter from which to reproduce a new joint, but in such cases the results are more favorable in the hip than in other joints

3 Acute infection. All evidence of an acute infection must have subsided before the institution of operative measures

4 Osteoporosis or atrophy. All evidence of osteoporosis or bone atrophy, which may follow any pathological process in the bone, must have disappeared with restoration of normal bone before arthroplasty should be considered

5 Arthritis deformans. When the ankylosis is the result of a low grade, progressive arthritis, as arthritis deformans, the procedure is justifiable only as an experiment after the process has apparently been arrested

In fact, surgical operations for the purpose of mobilization are rarely advisable, except when the ankylosis has been caused by (1) trauma which crushes the articular surfaces, tears the periosteum, and produces multiple fractures, or (2) acute infectious arthritis, which is, in a large percentage of cases, the etiological factor and is caused by one of the pyogenic organisms, the staphylococcus, streptococcus, pneumococcus, gonococcus, etc. In primary invasion of joints, these organisms erode the cartilage and superficial bone, but seldom does the infection extend into the



Fig 2 Roentgenogram 1 year and 6 months after arthroplasty of hip. There was a large cavity in the head which made complete remodeling necessary

shaft. The quality of the resulting ankylosis from these two causes is the same, and the prognosis is the same. The gonococcus remains active for a longer period of time than the other organisms, prolonging the subacute stage, thus deferring but not contra indicating operation or rendering it less favorable

In operating on the knee and certain other joints, as stated in former contributions, the general plan of procedure has been to reconstruct mechanically a joint which would produce function without regard to anatomical detail. With rare exception, the only possible construction in the hip is the ball and socket which conforms in contour with the normal. The operative technique in unilateral ankylosis is as follows

The patient is placed on the unaffected side. The U shaped skin incision of Kocher is made, beginning below the anterior superior spinous process, passing downward and backward about 1.5 inches below the greater trochanter and then upward for several inches. The deep fascia and gluteal muscles are incised in the same direction, but within and encompassed by the skin incision. The greater tro-

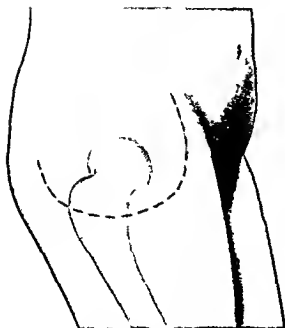


Fig. 3 Kocher's approach skin incision for arthroplasty of hip

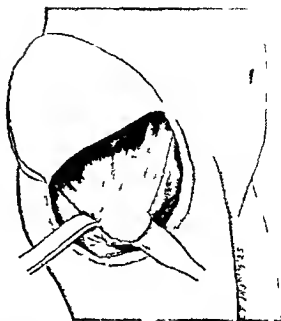


Fig. 4 Removal of greater trochanter and continuation of incision to capsule of joint

chanter is severed and dissected upward with gluteal muscles. A straight incision is made down to and parallel with the entire neck of the femur extending about 2 inches upon the ilium. The capsule and adherent soft structures are separated from the neck borders and roof of the acetabulum with a heavy periosteal elevator. All scar tissue is thus separated *en masse*. In this manner hemorrhage is less and is better controlled than when the scar tissue is severed as occurs when the incision traverses the neck or follows the margins of the acetabulum. The joint line is not always visible as osseous fusion may be so completely organized that the neck of the femur is structurally continuous with the ilium. A point is selected about one fourth inch above the acetabulum where the fusion is severed with a large wood carver's chisel as suggested by Baer. The curve conforming to the head of the femur. The hip is next dislocated by forcible adduction when outward rotation gives excellent exposure to all parts. The head is remodeled to three fifths or four fifths of the normal size and rendered smooth by a shoemaker's rasp. Superficial bone for about one fourth inch is excised from the acetabulum, which is then repolished

with a Murphy reamer. This instrument is not efficient for the purpose of reaming out bone but is useful only as a finishing measure. From one half to one inch of bone is the sum total of the amount removed except when a large cavity or atrophic area is discovered in the head of the femur. Care must be taken that healthy spongy bone when possible forms the basis of the new articulation. The removal of loose particles of bone is greatly facilitated by a strong magnifying glass. Tissue must next be transposed as a substitute for synovial membrane and to prevent bony fusion. Sufficient experience has been required to state dogmatically that some material should be interposed between the raw bony surfaces in every instance. A free transplant of fascia lata from the lateral aspect of the thigh just above the knee has proved the most satisfactory. A histological review of a specimen removed at operation was made by Professor O. W. Hyman, of the University of Tennessee. It was found that the arrangement of cells in the deep layer was more regular and smoother than in the upper layers and the appearance was the same as in tendon tissue. Therefore, in transplanting, the membrane is reversed so as to place the

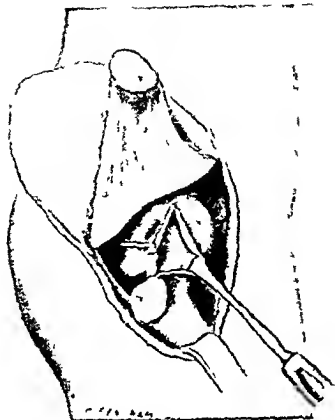


Fig. 5. Linear incision through capsule parallel to the neck of the femur after which the caps are peeled away from the entire neck with periosteal elevator.

smooth glistening surface within thereby facilitating gliding motion. A much larger piece is taken than is apparently required as there is material loss in dimension by contracture after removal. A sheet from 6 to 8 inches by 3 to 4 inches is sufficient. This is taken from the same side of the patient as the hip to be operated on as the patient lies on the opposite thigh. One end of the flap is stitched to the soft tissues about the margins of the acetabulum and is cupped so as to invest the surface. The other end invests the head and is held by a purse-string suture. It is also stitched to the adjacent soft parts or through drill holes in the neck to prevent possible derangement on motion. This makes one continuous membrane investing the entire joint, which forms a double layer between the raw articular surfaces. The pedunculated flap as advocated by Murphy has been abandoned except when a free transplant is not feasible, as it is difficult to obtain such a flap without doing an extensive dissection of the soft parts thus possibly increasing the local postoperative reaction. The capsule

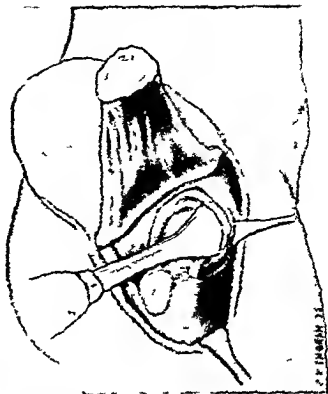


Fig. 6. Curved excision of bony femur in concave manner to base of head of femur with Wood-Carter's chisel.

deep fascia and skin are closed in the routine manner.

When malposition and contracture occur the following modifications in technique may be necessary. The posterior end of the U skin incision may be omitted while the anterior end is carried along the crest of the ilium so that the contracted flexors and abductors may be severed at their origin. Adduction may be corrected by subcutaneous tenotomy of the adductor tendons.

In bilateral or multiple ankylosis, the operation as well as the adjustment of the patient on the table is more difficult, and greater care must be taken not to contaminate in draping. The operative procedure is the same as for single hips except that the acetabulum is made larger and the head smaller. The head and neck must not be made too thin, or there will be imminent danger of fracture or dislocation. It is shaped into a pointed cone as has been suggested. Atrophy of the tip usually occurs with shortening and irregularity of the neck. The operation is attended with very little shock or pain during the period of operative convalescence or after-treatment.

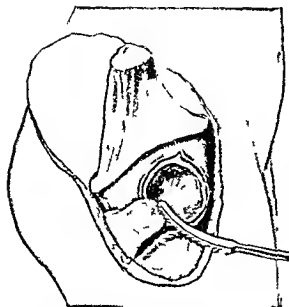


Fig. 7 Head of femur and acetabulum remodeled and rendered smooth with shoemaker's rasp

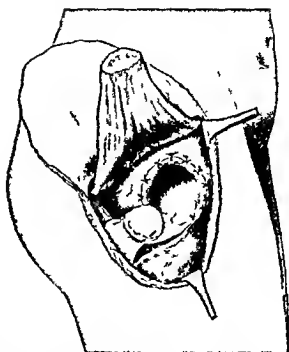


Fig. 8 Acetabulum and head of bone invested by free transplant of fascia lata from thigh just above knee. The entire joint is thus relined

When the operation is completed adhesive plaster strips 2 inches in width are attached to both sides of the limb from the upper third of the thigh to the ankle with the free ends extending about 6 inches below the foot. A plaster cast is applied from the ankle on the affected side to the nipple line and to the knee on the opposite side so as to fix and stabilize the opposite hip. Very thick padding is applied to the affected limb from groin to ankle to permit traction on the hip without the slightest impingement of the cast. In bilateral ankylosis the opposite limb is not included at the first arthroplasty as fixation exists by nature but if success is attained by operation on the hip both hips are immobilized at the second operation.

When the patient is placed in bed the adhesive straps are attached to an ordinary Buck's extension apparatus at the foot of the bed, with from 10 to 20 pounds of weight.

On the tenth day the cast is bivalved on the affected side from the ankle to just below the crest of the ilium so as to permit hip flexion. At this time the wound is dressed. If drainage is present the interior half of the cast is re-applied for one week but if there is complete healing of the wound or only a drop or two of serum, passive motion is instituted

by means of an overhead pulley and rope which may be attached to a bar over the bed. This apparatus is under direct control of the patient who begins with slight motion which is gradually increased. Motion must be given at regular intervals for a few minutes, beginning with every 2 hours during the day and every 4 hours at night. As the range increases and tenderness subsides, the intervals are decreased and the time of movements increased until about 10 minutes every hour is reached. However no arbitrary statements can be made, as the response of each case is the guiding factor. Local or general reactions must be avoided but should these occur fixation is applied until pain and soreness subside when movements are resumed. Active motion is encouraged as soon as possible and in this manner function is restored by coercion, not forced. If fusion begins in spite of all treatment, brisement force may be employed but not sufficient to induce violent reaction. This complication is avoided by increasing the range only a few degrees, but this measure is of very doubtful value. Fre-

quently, a recurrence of ankylosis is apparent at the end of 6 weeks to 3 months, which is evidenced by decrease in motion. This is often temporary, and the range of motion may again be increased. Physiotherapy is a useful adjunct and should be continuously employed for one year, when possible but is by no means essential to success, for function may be restored with only the intelligent co-operation of the patient.

The cast is removed at the end of 4 weeks when the patient is permitted to walk with crutches, but he is placed in the cast or an apparatus resembling the double Thomas hip brace at night and for 1 hour twice a day, to prevent malposition and any possible contracture of the soft parts. In resistant cases, the cast or apparatus may also be used for several months to fix the pelvis and prevent compensatory movement in the hip joint when passive motion is carried out at regular intervals.

Increase in weight bearing is determined by the density of the head and neck, as demonstrated by the roentgenogram, for osteoporosis or bone atrophy may follow any operative procedure on a joint and so decrease the resistance of the cancellous bone that compression and disintegration may occur from pressure induced by the weight of the body. Pathological fracture of the neck of the femur, or actual dislocation with a flail joint, may result. These complications can be avoided by the adjustment of weight bearing through apparatus which places the weight of the body on the perineum and tuberosity of the ischium but gradually permits weight to be borne on the foot as the tensile strength of the bone increases. The Thomas knee splint or caliper brace and the Bradford abduction brace are the appliances of choice. In unilateral ankylosis, crutches are discarded by the end of 2 or 3 months, but must be continued for a much longer period when the affection is bilateral. Active and passive motion must be continued at least three times a day for 1 year, to restore atrophic musculature which has often been inactive over a period of many years.

The roentgenogram, 6 months or more after arthroplasty of the hip joint, demonstrates

definite bone production about the margins of the articular surfaces. This has been mistaken for an active proliferative arthritis, though it would hardly be possible to remodel so extensive an area of raw bone without inducing appreciable reaction on the part of the osteoblast. The argument that such changes are not commensurate with durability is hardly tenable as the counterpart is formed in many useful and apparently normal joints the sequelae of trauma and infection which presents extensive hypertrophic changes. In fact, patients past 50 often show material evidence of osteoarthritis without clinical manifestations.

There are possible no accomplishments of surgery to which a counterpart cannot be found in nature, and this graphically applies to arthroplasty. We not infrequently observe a good functional joint which has been salvaged by nature following extensive destruction from a pathological process or severe trauma, as illustrated by the roentgenograms in two cases: the first, an end-result of tuberculosis or some low grade infectious process, the second, caused by a crushing fracture of the head of the femur.

The general impression prevails that the hip joint is more favorable for arthroplasty than the knee, which is probably based on theory and not substantiated by facts. Actual experience will demonstrate the reverse.

The estimate of results of arthroplasties in any one joint is difficult, since many factors influence the prognosis, such as the duration of ankylosis and the position in which ankylosis occurs, but with the data at present available, only two divisions are warranted in making an analysis of cases: (1) those in which ankylosis occurs in one hip, (2) those in which ankylosis occurs in both hips. Of the 48 arthroplasties of the hip, 23 were for ankylosis in one hip in 23 different patients, while 25 were bilateral ankylosis of the hip in 13 patients. Bony ankylosis was almost universally present. Of the 23 arthroplasties for unilateral ankylosis, 7 could not be traced, but were observed a sufficient length of time to obtain valuable information. This leaves a total of 16, in which arthroplasties were performed and the results tabulated.

ARTHROPLASTY FOR ANKYLOSIS OF ONE HIP

Of the 16 arthroplasties for ankylosis of one hip, 11 were in women and only 5 in men all were in young adults from 16 to 35 years of age which is the period of life more favorable for arthroplasty (Table I)

TABLE I—ARTHROPLASTIES OF THE HIP WITH UNILATERAL ANKYLOSIS

Case No.	Sex	Age	Date of Operation	Complications	Degree of Mobility	Stability	Endurance	Result
1	M		3-5-16	No	12	E	E	E
2	F	25	3-1-17	No	30	E	F	E
3	F	33	5-7-18	None	6	E	F	E
4	F	21	9-1-19	Infection	None			R
5	F	6	1-2-20	No	99	E	E	E
6	F	18	6-1-20	Neuritis	9	E	E	E
7	F	19	8-3-20	Infection				
8	F	29	3-1-21	Neuritis	30	E	F	E
9	M	15	5-4-23	Neuritis	None			R
10	M	3	8-4-23	Osteoporosis	7	D	O	F
11	M	27	10-3-23	None	30			R
12	F		8-6-24	Neuritis	90	E	E	E
13	F	19	-8-24	Neuritis	8	E	F	E
14	F	6	10-24-24	Osteoporosis	30	D	O	D
15	F		1-7-25	Neuritis	10	E	E	F
16	M	6	1-25-25	Neuritis	60	E	E	E

D—Doubtful
E—Excellent
F—Fair

D—Doubtful
R—Result

There were 4 with complications which should be elucidated. Case 4 had an infection with extrusion of especially prepared animal membrane which had been interposed. This material was later found to be defective as three other joints operated upon at the same time were similarly affected. In consequence all foreign material has been discarded as a substance for interposition in arthroplasties. Case 7 had a relighting up of an old tuberculous infection with death one year later as a result of miliary tuberculosis. Arthroplasty would not have been employed except for error in diagnosis as to causative agent. No accurate history was available and the roentgenogram was doubtful. In Case 6 there was neuritis with drop foot which persisted for several months with gradual and complete

recovery. In Case 9 there was a persistent neuritis and paralysis and an exploratory operation was repeatedly urged and refused after the lapse of 6 months from the time of operation. In this man there was ankylosis in extreme abduction the reduction of which must have caused trauma to the sciatic nerve though care was taken to avoid undue stress by severance of contracted tissues and the excision of sufficient bone.

In 2 there was osteoporosis with disintegration and absorption of the head but no displacement. In one of these patients who was referred by Dr. Robert Schueller and Dr. Clarence B. Francisco, of Kansas City, an abscess occurred 1 year after operation which was probably due to relighting up of the same infection that caused the ankylosis as there was primary healing with no evidence of infection after the arthroplasty. In both with osteoporosis there is good motion but time alone will determine the degree of efficiency. Both closely resemble the results of a reconstruction operation for ununited fracture of the neck of the femur.

Of the 16 patients there have been excellent results in 9, fair in 2, doubtful in one. There have been no operative deaths but one died 1 year later and death must be attributed to operation. In only 3 has ankylosis recurred.

Of 9 of the apparently excellent results, sufficient time has elapsed in 6 to conclude as to durability which are, respectively, 10 years $8\frac{1}{2}$ years, $7\frac{1}{2}$ years, 5 years $3\frac{1}{2}$ years, and 3 years. In all there is stability, endurance and efficiency, which, after all is the acid test.

ARTHROPLASTY FOR BILATERAL ANKYLOSIS OF HIPS

In patients with bilateral ankylosis the prognosis is more doubtful and the problem even more difficult than it is in patients with the ankylosis in one hip, for the following reasons:

1. Malposition is found in practically every case, which renders the operation more difficult.

2. The original infection is more virulent and of wider distribution. Often there is extensive osteomyelitis on both sides of the

joint, as evidenced by massive hypertrophy and increased density

3 The chance of relighting up a latent infection is obviously increased

4 The efficiency of the after-treatment is impaired by not having free motion in one hip to promote activity in walking

5 In addition to an infection which may have been general, enforced inactivity decreases the resistance of the individual

Our series includes 25 arthroplasties in 13 patients in whom bony ankylosis existed in both hips. The essential facts regarding these cases are analyzed in Table II

TABLE II—ARTHROPLASTIES OF THE HIP WITH BILATERAL ANKYLOSIS

Case No	Sex	Age	No of Arthroplasties	Complications	Degree of Motion	Result
17	M	30	1	Infection	None	Failure
18	M	30	1	Infection	None	Failure
19	M	19	1	Infection	50 in one hip	Excellent in one hip
20	M	20	4	Infection in 1	Unknown	Unknown
21	M	21	1	Infection		Died of acute sepsis
22	M	26	4	Infection in 1	30 in right hip 20 in left hip	Slight motion in both
23	M	20	3	None		Failure
24	M	24	1	None	None	Failure
25	M	23	3	None	90 in right hip	Excellent in one
26	F	20	2	None	60 in right hip None in left hip	Excellent in one
27	M	26	1	None	60 in right hip	Excellent in one
28	M	25	1	Infection		Died of acute sepsis
29	M	26	2	None	10 in right hip	Fair in one

In ankylosis of both hips, males were greatly in excess of females, there being 11 males and 2 females. Apparently, multiple infectious arthritis resulting in ankylosis is more

prevalent in men than women. This greater incidence in men may be due to gonorrhoea, of the 13 cases, the gonococcus was the probable causative agent in only one female.

In a condition so unbearable, the old adage, "If at first you don't succeed, try, try again" is justifiable, as the mortality is not high. In 25 arthroplasties in which both hips were ankylosed, 2 deaths occurred from relighting up of a virulent infection. In both, there was evidence of profound toxæmia immediately after operation. In the 25 arthroplasties of double ankylosis, there were 7 in which infection was relighted up, which might be expected in surgery following such extensive bone infection. In only 5 could the results be classed as good, and in one as fair. In no case was a practical range of motion secured in both hips. So far as function of the joint is concerned, only 5 of the 25 could be classed as good, but 5 of the 13 patients were afforded great relief by receiving a satisfactory range of motion in one hip and the correction of malposition in the other. One man, who had been bed ridden for 5 years with ankylosis of both hips and simple contracture of both knees, was able to walk after the correction of knee flexion, arthroplasty of the right hip, and osteotomy of the left. Therefore, the statement that only 5 out of 25 arthroplasties in bilateral ankylosis were successful is misleading, when the actual benefit accruing to the patient is considered.

In former contributions, conclusions as to various factors involved in arthroplasty have been given and will not be repeated. The object at the present time is to suggest, by the analysis of 48 arthroplasties of the hip, a possible basis for future investigation and to improve the chances of success in a joint which is relatively less favorable than is generally considered.

"TENOSUSPENSION" FOR HABITUAL DISLOCATION OF THE SHOULDER¹

By MELVIN S. HENDERSON, M.D., F.A.C.S., ROCHESTER, MINNESOTA
Sect. in Orthoped. & Surg. May Clinic

FIVE years ago I reported 19 cases of recurring or habitual dislocation of the shoulder joint in which operation had been performed. My present communication is a further report on the end results in the cases then recorded and a report of eleven additional cases in which operation has been performed since that time as well as a description of the changes in technique.

LITERATURE

The subject of recurring dislocations of the shoulder is of sufficient interest to stimulate frequent discussion in the literature, but reports based on a large number of cases and the end results are lacking. Thomas has reported 57 operations on 53 patients. He stands as an enthusiastic advocate for the operation of capsulorrhaphy. While one cannot agree with all his conclusions, nevertheless, his arguments for capsulorrhaphy must carry weight on account of his large experience and careful observation of his cases. His contention that dislocation following capsulorrhaphy may be a blessing in disguise will not be generally conceded. His argument in favor of what would ordinarily be considered as evidence of a failure is that if the arm is held to the side after the dislocation, even stronger cicatrization in the weak portion of the capsule occurs than would have resulted from the operation alone.

Many different operations have been suggested, but some sort of reefing or contraction of the capsule (capsulorrhaphy) stands pre-eminently as the most popular. Hippocrates suggested cicatrizing the capsule by introducing hot irons. Albert, in 1879, advocated arthrodesis. Cramer, in 1882, resected the head of the bone. Gerster, in 1883, resected a portion of the capsule and plicated it. Ricard, in 1892, recorded successful reefing of the capsule. Beck, in 1903, used plication, but he also carried a silver wire through holes bored in the acromion process and the head of the

humerus. Later he removed the wire. Young advocated the lengthening of the pectoralis major and teres major as he felt that they acted as a fulcrum. I have operated by this method in two cases, but in both instances the dislocation recurred. Clairmont dissected a good sized strip of the posterior portion of the deltoid free from its insertion, lifted it up, carried it through the quadrilateral space and the axillary space and fastened it securely to the tip of the coracoid process, thus giving a hammock-like support to the head of the humerus. Gibson has reported 7 cases in which operation was performed by this method. MacAusland, advocating capsulorrhaphy, has reported 6 cases. Valtancoli, of the Rizzoli Institute, reports 13 cases of capsulorrhaphy undertaken from 1901 to 1917, with cures and complete restoration of function in 86 per cent. These are quite the best results reported. Hildebrand recommends a plastic operation on the glenoid fossa, the joint being approached and opened from behind. He deepens the fossa at the expense of the posterior portion, thus leaving the abnormally prominent anterior margin as a block to the excursion of the head forward. Eden accomplishes the same result by a bone graft. Bankart believes that the pathology is in reality a tearing loose of the fibrocartilaginous glenoid ligament from the bone, and that capsulorrhaphy, accordingly, is not the rational line of treatment. He sews the capsule to the glenoid ligament and freshens the bone of the glenoid fossal margin so that the ligament will more easily adhere to it. Thomas, in treating resistant cases, particularly epileptic, advocates a large excision of the head of the humerus wherein he removes the only portion of the head that can leave the glenoid fossa. Joseph, in 1917, advocated suspending the head of the humerus by passing a piece of free fascia lata through holes bored in the head of the humerus and the

acromion process, thus preventing dislocations by aid of this artificial supporting ligament. Various modifications of this plastic suspension method have been advanced. Plummer and Potts recorded two cases so treated in this country.

The various operative methods may be briefly summarized as (1) operation on bone, such as arthrodesis or excision (only to be carried out in resistant cases), (2) plastic operation on the capsule (anterior or posterior capsulorrhaphy), (3) plastic operation on the glenoid fossa itself (Hildebrand) or the implantation of a bone graft on the anterior inferior margin (Eden), (4) plastic operation on the muscles such as Young's operation or the sling like action of the Clairmont operation, and (5) plastic suspension as originally advanced by Joseph.

PATHOLOGY AND SYMPTOMS

In recurring dislocation, the head of the humerus is practically always forward and downward, being of the subcoracoid type. Repeated dislocations produce in reality a hernia of the capsule between the insertion of the subscapularis and the origin of the fibers of the triceps at the inferior margin of the glenoid fossa.

There is no evidence that a misshapen head of the humerus or glenoid fossa is responsible for this condition. No abnormality is to be seen in patients who have had a few dislocations, and the changes that are evident in those who have been subject to numerous dislocations may be attributed to the repeated trauma incidental to the dislocation and the reduction. Once this habit of luxation is established, it is exceedingly troublesome as it may happen on the slightest provocation, it is not unusual for patients to report more than 100. The dislocations may occur while the patient sleeps or when he is reaching for some object about the level of the shoulder. The disability is immediate and the pain is usually severe, consequently relief is sought at once. In some patients, particularly those of athletic build, reduction is quite difficult and often anesthesia is necessary, in others the trick of relaxing the muscles at the right moment is learned and reduction is easily accomplished.

The posterior dislocations are less difficult to reduce and may be of the snapping type in which the patient is able to put the head back by his own efforts.

There is no way of knowing the percentage of recurring dislocations following the ordinary traumatic dislocation. Usually the initial displacement is produced by trauma that is sufficient in itself to cause such a condition, so that, while the shoulder in certain persons may have an inherent instability, such cases are rare. The primary dislocation or the subsequent treatment must therefore be held responsible. The possibility of recurring dislocation following traumatic displacement must always be taken into account during treatment, and the after care must be carefully supervised. Since a dislocated head of the humerus must come out through a rent in the capsule and must be put back through the same opening, the treatment after reduction should be directed toward the healing and firm cicatrization of that tear. The arm should be held fixed to the side for 3 weeks and carried in a sling, and should not be abducted to a right angle for 6 weeks. Slight residual stiffness will follow, but by physiotherapeutic measures this may be readily overcome. If this course is not followed the surgeon must accept the responsibility of a possible recurrence of the dislocation, and the consequent establishment of the habit. If there is a second dislocation, the treatment outlined most certainly should be followed, the period of fixation being extended to 5 or 6 weeks. By such measures the rent in the capsule is allowed to cicatrize firmly. Habitual dislocations, not infrequently bilateral, are seen only too often in cases of epilepsy and are an added affliction to an already pitiful condition.

In the Mayo Clinic, there are records of 35 cases of recurrent dislocation of the shoulder. Operation was advised in 32 cases and performed in 30. In the latter group 20 of the patients were males and 10 females. All except one patient assigned trauma as the cause of the initial dislocation. Four of the patients had epilepsy. In 20 cases more than 5 years have elapsed since capsulorrhaphy was performed. In 6 cases between 1921 and February, 1924, the Clairmont operation was performed.

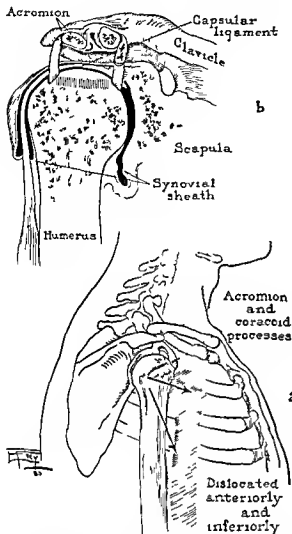


Fig. 1 a Shadow outline showing the direction in which the dislocated head moves b Tenosuspension of head of the humerus to the clavicle and acromion process using the peroneous longus tendon

Since February, 1924 operation had been performed in 4 cases the operation in 3 being tenosuspension, herein described and in one case posterior capsulorrhaphy for habitual posterior dislocation. Of the entire series, a secondary operation was performed in 3 cases. In one other case the primary operation had been performed elsewhere making four secondary operations in all.

TECHNIQUE OF OPERATION

Capsulorrhaphy is the operation commonly performed. In my experience the operation

TABLE I CAPSULORRHAPHY PERFORMED MORE THAN FIVE YEARS PREVIOUSLY (1912 TO 1921)

Patients	20
Information received from	19
Cured (no dislocations) (42.1 per cent)	8
Decidedly improved (one to three dislocations) (31.6 per cent)	6
Operation a failure (many dislocations) (26.3 per cent)	5
December 15 1925	

TABLE II CLAIRMONT OPERATION PERFORMED MORE THAN ONE YEAR AND NINE MONTHS PREVIOUSLY (1921 TO FEBRUARY, 1924)

Patients	8
(Cases 9 and 27 double operations)	
Information received from	8
Cured (62.5 per cent)	5
Operated on a failure (37.5 per cent)	3
December 15 1925	

has not given the percentage of perfect results that should be expected. Complete records were obtained of 19 cases in the Mayo Clinic from 1912 to 1921 (Table I), the shortest period after operation being 5 years. In only 8 cases (42 per cent) has there been no subsequent dislocation although in 14 cases (73 per cent) the patient was either cured¹ or decidedly improved and satisfied with the result. In 5 cases (26 per cent) the patient was no better after the operation.

In an effort to obtain better results a change was made to the Clairmont or sling operation. Results were only slightly improved (Table II). Eight patients were operated on by the Clairmont method, three have since had dislocations. In one case, that of a young man with epilepsy a "tenosuspension" operation has been performed since. In the case of another failure capsulorrhaphy had previously been performed. Although the patient was advised to return for a "tenosuspension" operation, he has not done so. In the third no previous operation had been performed.

The plastic suspension method was first described by Joseph in 1917. It appears to be a logical means of preventing anterior but not posterior dislocation. With anterior dislocation the head of the humerus must go downward and forward (Fig. 1a). If the downward excursion can be prevented the dislocation

¹ Only those patients who have had no subsequent dislocations are classified as cured.

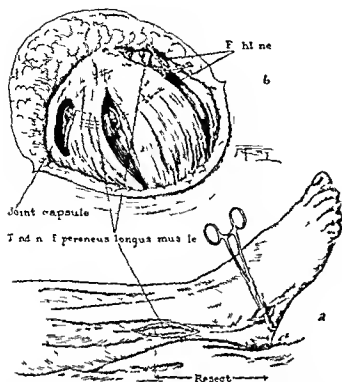


Fig 2 a Incision used in resecting the portion of the peroneus longus b Fibers of the deltoid separated anteriorly and posteriorly The peroneus longus placed through the holes and fastened with silk As a precaution a braided silk fishline is also passed through

will not occur, for there is sufficient muscular protection in the supero anterior part of the joint to prevent the head from slipping out. Joseph used fascia lata for the artificial ligament and this has been used in various ways since I have used a full thickness of the peroneus longus muscle, carefully inserting it through holes bored through the head of the humerus and the clavicle and acromion process (Fig 2b). I have used the peroneal tendon for other disabilities also, such as the reconstruction of a torn triceps tendon or a divided patellar ligament, and it is a splendid heavy piece of tissue for such purposes. It is not missed by the patient, for both the proximal end and the distal end are sutured to the peroneus brevis. It is much stronger than the fascia lata and may be removed through two small incisions (Fig 2a). The technique of "tenosuspension" is simple. With the patient on the sound side, at an angle of 45 degrees to the table, and the arm by the side, a curved incision is made with the base upward, extending from just in front of the head backward to the posterior aspect of the shoulder. This flap is turned upward, exposing the deltoid

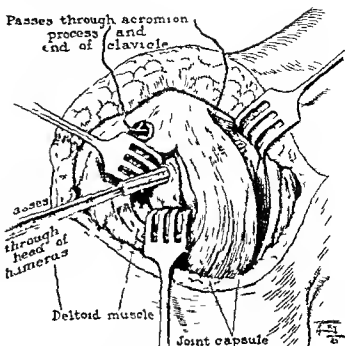


Fig 3 Drill inserted through head of humerus

muscle and the acromio clavicular joint. The acromion process is exposed and a drill passed through it or through the acromio clavicular joint. The instrument used is the drill attachment to the Murphy reamer. The drill is about 10 millimeters in diameter. The fibers of the deltoid are then separated anteriorly and posteriorly (Fig 2b), the tendinous insertions of the supraspinatus and infraspinatus are separated, and the capsule is exposed. The drill is then passed through the greater tuberosity (Fig 3). If the joint is opened it is of no consequence. About 10 centimeters of the tendon of the peroneus longus, consisting of its entire thickness, is then removed from the leg, the foot and leg of the same side having been previously prepared. The piece of the tendon is then passed through the drill holes, drawn tight, and sutured together with silk. In cases of epilepsy or in cases in which there is any danger of dislocation during the recovery from anesthesia, a braided silk fish line is also passed through the channel in the bones and tied securely, thus preventing any undue strain on the new ligament until it has had time to become secure in its new bed (Fig 2b). The wound is then closed and the patient put to bed with his arm strapped to his side where it is held securely for 10 days, when the stitches are removed. The patient is cautioned not to

raise the arm from his side for at least 6 weeks and not to the level of the shoulder for at least 6 months. For 3 months he is to sleep with the arm bandaged to the side. In the three cases in which this technique was followed there have been no recurrences. Twenty two months is the longest time since the operation.¹

CONCLUSIONS

In my experience capsulorrhaphy and the various plastic muscle operations have not resulted in cure as often as the patients have a right to expect. I believe that the results of the operation of "tenosuspension" herein described, will more nearly approach the percentage of cures that should be expected.

REPORT OF CASES

CASE 1 A laborer aged 24 came to the clinic for examination in April 1912. Six years previously he had dislocated his shoulder and the dislocation was not reduced for 36 hours. After that there had been frequent dislocations as they were not prevented by appliances. Capsulorrhaphy was performed in April 1912 and there were no more dislocations until November 1913. In January 1914 the Young operation was performed. Dislocation has since occurred and therefore treatment must be considered to have failed.

CASE 2 A laborer aged 25 came for examination in July 1913. Five years before his left shoulder had been dislocated in a runaway accident. Later he had had seven dislocations and was incapacitated for a month after each. There had been an interval of 2 years between the last two dislocations, the latest one occurring in June 1913. Capsulorrhaphy was performed in July 1913. In a communication dated August 1917 he stated that he had had no further trouble and was doing everything he wished to do with his arm. In the last letter October 1920 he stated that the arm was normal. This patient was evidently cured.

CASE 3 A clerk aged 19 was first examined at the clinic in August 1913. Eighteen months previously the shoulder had been dislocated while he was playing hockey. During the 18 months the dislocation occurred probably a dozen times, the last time while he was swimming. Capsulorrhaphy was performed in August 1913. The patient's mother stated in September 1917 that the arm felt somewhat weak but that dislocation had not occurred. In July 1920 6 years and 11 months after operation the patient dived with his arms in the usual position, the shoulder was dislocated on striking the water. This is the only dislocation reported since the operation. This patient's condition was decidedly improved.

¹† date June 8 1926 there have been no recurrence

CASE 4 A merchant, aged 41 was examined in June 1914. Nineteen years before he had fallen and dislocated his right shoulder. The dislocation was reduced immediately. Dislocation occurred several times during the next 4 years and then he caught a cold which seemed to settle in the right shoulder. For 4 months soreness prevented his lifting the arm to the head. After that dislocation was frequent. Ten years before the examination he fell and in catching himself dislocated the left shoulder. The left shoulder however was not dislocated during the last 2 years and I consider the dislocation merely the result of ordinary trauma. The right shoulder was dislocated repeatedly, the last occasion being 3 weeks before the examination. Capsulorrhaphy was performed in June 1913. In a communication in August 1917 the patient asserted that he had had no further trouble and was getting along nicely. In February 1920 5 years and 8 months after operation he dislocated his right shoulder although he was not exerting it unusually, but he had no further dislocations up to October 8 1920 and has reported none since then. This patient may be regarded as decidedly improved.

CASE 5 A bookkeeper aged 33 was examined in November 1914. After a dislocation of the left shoulder 7 years previously there had been recurring dislocations at least twelve a year. He sometimes threw the shoulder out of joint in reaching for something on a shelf. In November 1913 capsulorrhaphy was performed. The patient was not troubled again until May 1915 when he had a peculiar feeling that the shoulder was going to slip out of joint. In September 1917 he reported that during the year the shoulder had slipped out twice. The patient reported last October 1 1925 he stated that he considered himself greatly improved as he had had only three or four dislocations up to April 1920 and none since and he believed the shoulder was getting stronger. His condition was decidedly benefited by the operation.

CASE 6 A lawyer aged 25 was examined in February 1915. Eight years before he had dislocated his shoulder while playing football. It was dislocated the next time while he was swimming, the third time while he was playing baseball and since then it had slipped out while he was sleeping. At the time of the examination he was wearing a band around the body to hold the arm to the side. He had worn it steadily for a year and a half thus averting dislocation. Capsulorrhaphy was performed in February 1915. In August 1917 the patient wrote from an officers training camp that he had been able to do his bit in such strenuous tests as digging trenches, bayonet exercises and trench storming without suffering the slightest inconvenience or trouble from the shoulder. A letter dated October 1920 and information received indirectly recently state that he has had no further trouble. He is considered cured.

CASE 7 A merchant aged 30 was examined in April 1916. Ten years before he had dislocated his

shoulder The dislocation persisted for 2 days and then reduced itself which suggests that it may have been a subglenoid dislocation The shoulder was later dislocated many times and the patient had to take gas ether, or chloroform about ten times for reduction In April, 1916, the Young operation was performed In a letter dated August, 1917, the patient declared he had had no further trouble and that this shoulder seemed as strong as the other In another communication, April 8, 1920, he stated that while asleep 2 years and 6 months after the operation he had had a dislocation which required an anesthetic for reduction His last letter October 3, 1925, reports frequent spontaneous dislocations since 1920 Operation was a failure in this case

CASE 8 A nurse, aged 33 was examined in July, 1917 Thanksgiving day, 1915 a fall dislocated her shoulder It was reduced about an hour later, and was held to the side for 10 days The next dislocation occurred Christmas day, 1916, and four dislocations followed at later dates Capsulorrhaphy was performed in July, 1917 The patient states that she was well until April, 1924, when the shoulder was dislocated again No further reports have been received She is classified as improved

CASE 9 A teacher aged 46, came to the clinic for an examination, June 4, 1918 Fourteen years before he fell on the left shoulder and dislocated it He thought he had had at least thirty dislocations, three in the last 9 months A pull on the shoulder reduced the dislocations so that it was not necessary to call medical aid An operation was performed June 11, 1918 consisting of capsulorrhaphy and lengthening the tendon of the pectoralis major A little more than a year after the operation dislocation occurred twice in 1 month The patient wrote October 8, 1920, that the shoulder had been out of joint many times He returned for treatment and the Clairmont operation was performed in June, 1921 He was well for 2 years, but the last communication in February, 1924 states that there were two dislocations during the preceding year He is classified as improved

CASE 10 A man aged 20 who was examined June 24, 1918, is subject to epilepsy, attacks occurring about once a month For 6 years he was in a hospital for the insane During an epileptic seizure 6 months previous to examination here, he fell against a radiator and dislocated the right shoulder Later it dislocated during seizures or some trivial act such as throwing a stone or sneezing A capsulorrhaphy was performed June 29, 1918 Three months afterward the right shoulder was again dislocated A letter of September 18, 1920, from the superintendent of the State School for the Feeble Minded, stated that both shoulders were now dislocated during the epileptic attacks No further report has been received The operation in this case must be regarded as a failure

CASE 11 A billiard room marker aged 37 was examined July 1, 1918 Ten years before he had been in a railroad wreck and the left shoulder had been dislocated The shoulder reduced with a snap when

he took hold of a board and pulled hard The patient stated that he had had about eight dislocations in all He insisted that the dislocation always occurred posteriorly and July 6, 1918, when he was prepared for operation and thoroughly relaxed under the anesthetic the shoulder was dislocated posteriorly Accordingly a posterior incision was made through the supraspinatus muscle the capsule was opened and overlapped, as was also the muscle A report from the patient October 10, 1925, states that he has had no more dislocations and that function is perfect

CASE 12 A woman, aged 19 was examined August 27, 1918 Four years before, the right shoulder had been dislocated one year later it was dislocated during a basketball game, and the same accident occurred once a year for two years and then quite often Anterior capsulorrhaphy was performed September 13, 1918 The patient had had no further dislocations when last heard from in October, 1925, and may therefore be considered cured

CASE 13 A man aged 41, was examined September 24, 1918 He came for consultation primarily because of recurring, double, direct inguinal hernias The record unfortunately is incomplete in so far as the shoulder is concerned, merely stating that the patient had recurrent dislocations of the left shoulder, for which an anterior capsulorrhaphy was performed October 24, 1918 In a letter dated August 10, 1925 he reported that he has had no further dislocation This man was apparently cured

CASE 14 A farmer, aged 23 examined September 26, 1918 had dislocated his right shoulder 2 years before Six months later luxation occurred again, and during the year previous to examination it had occurred seven or eight times October 10, 1918, a capsulorrhaphy was performed on the right shoulder In a letter written during April, 1920 he stated that he had a severe fall 11 months after the operation which dislocated the shoulder but he believed that the fall was sufficient to cause a normal shoulder to be dislocated The last letter, dated October 13, 1920 states that he has since had three more luxations all caused by very slight trauma Operation was therefore a failure

CASE 15 A man aged 35 who was examined September 13, 1919 had had epilepsy since he was 15, but came to the clinic for the purpose of having the right shoulder fixed if possible so that it would not become dislocated so easily The first luxation had occurred 4 years before, and there had been about fifteen luxations since Capsulorrhaphy was performed September 22, 1919 A letter in October 1920, stated that there had been no further dislocations, and a communication in February, 1925 made the same statement The patient is classified as cured

CASE 16 A man, aged 29 was examined December 12, 1919 because of a dislocating right shoulder The first dislocation was sustained during a wrestling bout, 6 or 7 had occurred since, one when he was swimming and one when he sneezed December 16,

1919 the usual capsulorrhaphy was performed except that an attempt was made to include more tissue in the overlapping and two strands of silk were used. The operation was made more difficult than usual by the greater amount of hemorrhage and the patient was quite muscular so that exposure was difficult. A numbness of the right hand followed the operation this gradually improved. February 4, 1920, a neurological examination showed an irregular distribution of sensation and it was decided the condition was merely a traumatic neuritis of the brachial plexus and that no nerve or nerves could be singled out as being involved. This is the only case in this series in which trauma was inflicted on the nerves and the only explanation I can offer is that most probably the efforts made in retracting to obtain exposure were too vigorous. A letter from the patient June 25, 1924, states that he has since had four dislocations of the shoulder all occasioned by very little trauma and that numbness in the hand is present at intervals. This patient was not benefited.

CASE 17. A man aged 22 was examined March 17, 1920. Three years before in jumping over a fence and holding the arms abducted as one does in jumping over an obstacle the right shoulder was dislocated. Dislocation occurred twice afterward the first time when he jumped from a bobsled 2 weeks before examination here. This case is of interest since so far as could be learned there had been no primary severe trauma as had occurred in the other cases. March 23, 1920, capsulorrhaphy was performed and the pectoralis major was lengthened. No reports were received from this patient so the result is not known.

CASE 18. A man aged 22 examined June 16, 1920 had dislocated his left shoulder in September, 1914, while playing football. One month later during a game of football the joint luxated again. Following this the patient had seven dislocations, one while swimming and one while in bed after a 15 months interval. June 18, 1920, capsulorrhaphy was performed the sheaths of the teres major and of the pectoralis major were lengthened. A letter dated April 5, 1921, reports one dislocation. He has not been heard from since. He is classified as improved.

CASE 19. A man aged 36 was examined February 22, 1920. He had had epilepsy for 8 years but the first dislocation of the left shoulder occurred 5 months before examination at the clinic. A second dislocation had occurred 6 weeks before during a seizure. Unfortunately the physician in reducing it broke the surgical neck of the humerus. An open operation was performed and good position was secured but during an epileptic attack (these attacks usually came on during sleep) the shoulder luxated. When he was seen the position of the fracture was so poor and the dislocation had been present so long that the head was excised. He was last heard from in July, 1921, when he had good function and had experienced no further dislocations. This patient is considered cured.

CASE 20. A teacher aged 25 was examined December 5, 1920 just after a fall in which she had suffered a dislocation of the left shoulder which was immediately reduced. She gave a history of four previous dislocations of the same shoulder occurring since 1914. Capsulorrhaphy was performed December 23, 1920. The last report was August 11, 1925, in which the patient says that there is perfect function and that there has been no recurrence of the dislocation. She is classified as cured.

CASE 21. A student aged 18 was examined August 23, 1921. While playing basket ball 18 months previously she had dislocated the left shoulder. Six months later it was dislocated again and between then and the time of her examination twelve or fourteen times more. The Clairmont operation was performed August 30, 1921. The patient was last heard from in 1925, there had been no recurrence and function was perfect. She has been classified as cured.

CASE 22. A housewife aged 33 who was first seen June 20, 1922, had had a fall on the outstretched arm resulting in an anterior dislocation of the shoulder 13 years before. Since then she had had twelve or fourteen dislocations, they occurred when the arm was abducted and externally rotated the last one 2 weeks before examination. The Clairmont operation was performed June 22, 1922. The shoulder was redislocated by slight trauma October 3, 1923, and September 10, 1924, when the patient was last heard from she had had five or six more dislocations. Operation was therefore a failure.

CASE 23. This patient was first seen in 1918 when two and one half years old at which time a diagnosis was made of birth paralysis of the left arm from instrumental delivery. She was seen again in March, 1920, at which time the paralysis had improved considerably but she had developed a habitual posterior dislocation of the left shoulder. She came back again and the Clairmont operation was performed August 9, 1923. There had been no further dislocation when the child was last seen in January, 1924. The last report on January 20, 1925, shows further improvement in the paralysis with no further dislocation of the shoulder. This patient has been classified as cured.

CASE 24. A lumber dealer aged 31 was examined October 4, 1923. He dislocated the left shoulder the first time in 1912 while playing football and since then has had about twenty five recurring dislocations caused by slight trauma. The Clairmont operation was performed October 9, 1923. A letter dated September 12, 1925, reports some weakness in the shoulder fairly good function and no further dislocation. Operation was successful in this case.

CASE 25. A hotel manager aged 33 was seen regarding his shoulder in February, 1924. He had first dislocated the left shoulder while playing football in 1909 and had had recurring dislocations until 1912 when he was operated on elsewhere without success. Since that time he had had at least fifty dislocations and reduction was often very difficult.

The Clairmont operation was performed February 12, 1924. The patient was seen October 31, 1925, and the shoulder was stable, function was perfect and there had been no further dislocations. He is considered cured.

CASE 26. A farmer, aged 25, gave a history of a fall on the outstretched hand in 1920 which produced a dislocation which he reduced himself. Another fall in April 1923, resulted in a dislocation, and later he had had four, occasioned usually by a slight pull on the outstretched arm. He was examined December 20, 1923, and the Clairmont operation was performed February 22, 1924. A letter October 7, 1924, reports that the shoulder is rather weak and somewhat stiff, but that there have been no further dislocations. The patient is classified as cured.

CASE 27. A man, aged 30, had been examined a number of times since childhood and had been treated for various troubles including epilepsy. The left shoulder was dislocated spontaneously in 1921, according to the history. There were eight luxations up to June 19, 1923, when the patient was first examined regarding this condition. The Clairmont operation was performed October 4, 1923. June 20, 1924, the shoulder was redislocated while the patient was reaching for a glass of milk. There were repeated dislocations until December 4, 1924, when a tenosuspension operation was performed. Up to the present there have been no more dislocations in spite of repeated epileptic seizures.

CASE 28. A housewife, aged 33, was examined April 14, 1925. She had had a dislocation of the left shoulder in 1920 during an epileptic convulsion and before examination had had about thirty two dislocations, all during the convulsive attacks. She was operated on elsewhere in 1923 without benefit. The "tenosuspension" operation was performed here April 30, 1925. A letter dated October 4, 1925, reports no further dislocations.

CASE 29. A woman, aged 32, had had a loose right shoulder ever since she could remember. The first dislocation was caused by a fall on the outstretched arm. Several years later another dislocation occurred while she was playing basket ball. Since that time there had been ten or twelve more, induced by very slight trauma and recently one or two which occurred during sleep. A tenosuspension operation was performed September 11, 1925. A letter dated October 22, 1925, says that she is back at work and has had no further trouble with the shoulder.

CASE 30. A girl, aged 16, was examined November 21, 1925. Two years before, her right shoulder

had pulled out of joint while she was playing. Dislocation was reduced but recurred and anterior capsulorrhaphy was performed elsewhere. Anterior luxations were stopped, but posterior luxations recurred and were of the snapping type. On November 30, 1925, posterior capsulorrhaphy was performed. The patient was put to bed with the arm held to the side and the forearm held in external rotation. It is too soon after operation for any definite results to be determined.

BIBLIOGRAPHY

- 1 ALBERT. Quoted by MacAusland
- 2 BANKART A S. Blundell. Recurrent or habitual dislocation of the shoulder joint. *Brit M J*, 1923, **ii** 113-1133.
- 3 BECK CARL. Humeroacromial suture for habitual dislocation of shoulder. *New York M J* 1903 **lxviii**, 64.
- 4 CLAIRMONT. Ueber neue Operationsmethoden bei habitueller Schulterluxation. *Wien klin Wchnschr*, 1917 **xxx** 1507.
- 5 CRAMER F. Resektion des Oberarmkopfes wegen habitueller Luxation. *Berl klin Wchnschr* 1882 **xix** 21-5.
- 6 EDEN, R. Zur Operation der habituellen Schulterluxation unter Mitteilung eines neuen Verfahrens bei Abszess am inneren Flankenrande. *Deutsche Zeitschrift f. Chir* 1918 **cxlv** 69-280.
- 7 GERSTER. Quoted by MacAusland.
- 8 GIBSON ALEXANDER. Recurrent dislocation of the shoulder joint. *Canad M Ass J* 1921 **xi** 194-199.
- 9 HENDERSON M S. Habitual or recurrent dislocation of the shoulder. *Surg Gynec & Obst* 1911 **xxii** 1-7.
- 10 HILDEBRAND. Beitrage zur operativen Chirurgie. *Arch f. klin. Chir*, 1902 **lxvi** 347-376.
- 11 HIPPOCRATES. Quoted by MacAusland.
- 12 JOSEPH E. Eine neue Operation zur Verhuetung der habitueller Schulterluxation. *Berl klin Wchnschr* 1917, **liv** 525.
- 13 MACAUSLAND W R. Recurrent dislocation of the shoulder with report of cases. *Surg Gynec & Obst* 1924 **xxxviii** 739-747.
- 14 PLUMMER W W, and POTTS, F N. Two cases of recurrent anterior dislocation of the shoulder. *J Bone & Joint Surg* 1925 **vii** 190-198.
- 15 RICARD. Quoted by MacAusland.
- 16 THOMAS T T. A new method of excising the head of the humerus. *Ann Surg* 1917 **lxvi**, 402-405.
- 17 Idem. Recurrent dislocation of the shoulder joint. *J Am M Ass* 1925 **lxxxvi** 1202-1208.
- 18 VALTANCOLI GIOVANNI. Sulla lussazione abituale di spalla. *Chir d'org di movimento* 1924 **ix** 131-140.
- 19 YOUNG, J K. Recurrent dislocation of the shoulder joint. *Ann Surg* 1916 **lxiii** 375.

COMBINED INTRA-UTERINE AND EXTRA-UTERINE PREGNANCY

WITH A REPORT OF TWO HUNDRED SEVENTY-SIX CASES, INCLUDING
TWO NEW CASES OBSERVED BY THE AUTHOR¹

By EMIL NOVAK M.D. BALTIMORE MARYLAND
From the Gynecologic Department of Johns Hopkins Medical School

THE co-existence of intra uterine and extra uterine pregnancy is sufficiently rare to justify the report of 2 additional cases, and sufficiently frequent to warrant a consideration of the diagnostic and therapeutic problems which it presents. The simultaneous occurrence of gestation within and without the uterus is of course a type of twin pregnancy, one fertilized ovum implanting itself in the uterus and the other in the tube or perhaps, rarely, in the ovary. It is not surprising, therefore that in quite a number of the reports in the literature mention is made of the occurrence of multiple pregnancies either in the previous history of the patient herself or in that of some member of her own or her husband's family.

On the other hand there is a group of cases in which the combination of pregnancies is due to the superimposition of a uterine gestation upon a previous one in the tube. The tubal condition may antedate the uterine by a very short or a very long interval. Angell (1) believes that his case is of this type although this is a point obviously difficult to prove. Cases have been reported in which the presence of very old tubal lithopedions, of perhaps as much as 30 years' standing, did not offer a bar to the occurrence of a uterine conception. A large number of tubal pregnancies never come to operation, undergoing spontaneous resolution, although vestiges may remain for long periods of time. In early pregnancies these may be represented by only a few hyalinized or fibrotic villi, with perhaps blood pigment deposits in the tubal mucosa. In the later stages mummification or lithopedion formation may be noted. In either event the inhibition of ovulation is soon lifted and there is no reason why fertilization can not occur. Many instances of this type, in which the designation of compound rather than combined pregnancy is more appropriate

are to be found in the literature. They are not properly considered in the scope of this paper which deals with cases in which the two pregnancies are simultaneous and concurrent. A good example of compound pregnancy is the one reported a few months ago by Lwers (13). In this case the intra uterine pregnancy was complicated by a lithopedion remaining after a spurious labor 3 years previously.

One might theoretically expect that extra uterine pregnancy would occur even though uterine gestation already existed. Certainly the presence of the embryonic sac would scarcely be an obstacle in early pregnancy for it does not completely fill the uterine cavity until about the fourth month. It would obviously be even more difficult to establish the occurrence of superfetation in this type of case than in the case of multiple uterine pregnancy in which even marked differences in the degree of development of the fetuses are inconclusive in this respect. In the case of combined pregnancy such evidence would of course be worse than useless. The sequence of intra uterine pregnancy, followed at a short but clearly removed period by ectopic pregnancy has not so far as I can find, been established in any reported case.

INCIDENCE

The first case of combined pregnancy is said to have been recorded by Duverney in 1708. The diagnosis in this instance was made at autopsy, the mother having died in the third month of pregnancy as a result of rupture of the extra uterine sac. Since that time the number of reports has increased, at first very slowly, but in recent years much more briskly. In 1902 Zinke (36) was able to collect 88 cases, while in 1904 Simpson (30) gathered 113. The search of Neugebauer (24) in 1907 was apparently considerably more

¹Read at the annual meeting of the Southern Surgical Association, Louisville, Kentucky, December 16, 1915.

thorough, for he presented a study of no less than 169 cases, and in 1913 had increased the number to 244 (243 in the original paper, with one postscript case). A survey of the subject may logically take as its point of departure the two papers of Neugebauer, one bringing the literature from the earliest days up to 1907, and the second continuing it, with equal exhaustiveness, to 1913. This plan I have followed, having devoted myself more especially to a collection of all the cases reported since Neugebauer's second paper in 1913. The number yielded is somewhat smaller than might be expected from comparison with other similar time periods, obviously because of the inhibitory influence of the World War upon medical literature in general. Thirty-two new cases have been collected, including the 2 being reported in this paper. This brings the total number of cases to date up to 276. It need scarcely be said that this number is probably only a fraction of those which have actually been observed. While this statement is true of most other conditions as well, it applies with especial force to those which are so commonly unrecognized as the one now under discussion.

I have appended to this paper brief reports of the 32 cases which I have collected in the literature from 1913, including the 2 cases which I have myself observed. A number of others reported under this general caption I have eliminated because they appeared to me quite questionable. For example, Rouvier's case (28) is reported as one of combined pregnancy with recovery without surgical intervention. The diagnosis appears to have been based on the development of a fluctuant tumor behind the uterus, with reddish discharge, in a patient who had just had an abortion. In view of the obvious possibilities of error in such a diagnosis, it would seem proper to exclude this case from the series. There is, moreover, another element of uncertainty in quite a number of the cases included in the series, and of course in Neugebauer's as well. In only a minority is mention made of microscopic examination of the tubal sac. As a rule, however, the description of the pelvic findings, with usually tubal rupture or abortion, and the presence of free blood in the pelvis, leave

little doubt as to the correctness of the diagnosis of extra-uterine pregnancy. The same statements apply to the diagnosis of the intra-uterine gestation. In one or two of the cases it is stated that the patient, after bleeding and pain, had passed a lump from the uterus, supposedly representing an early abortion. It is difficult to be sure, from the description, that it was not a uterine cast, such as is so commonly expelled in cases of ectopic pregnancy, the condition from which these patients also suffered.

As already stated, combined pregnancy is merely a manifestation of twin gestation, which is far more frequent than twin births, for in a considerable proportion of cases one of the twin embryos succumbs. Indeed, one author has advanced the startling theory that the primitive norm for the various types of mammals is to bear as many young as they have breasts. According to this twin pregnancies in the human would be an atavistic manifestation. The destruction of one twin may occur at a fairly advanced stage of pregnancy (fetus papyraceus, etc.) or at a very early stage, when the only vestige of the embryo may be a tiny cyst on the placenta of the survivor. The lodgment of one embryo in the tube probably occurs far more frequently than is supposed. This is indicated not only by the great frequency of tubal pregnancy in general, but also by the now generally accepted belief that many tubal pregnancies are unrecognized clinically and pass on to spontaneous resolution.

It is of interest to note, in connection with the twin pregnancy idea, that in at least 6 of the 276 cases collected in this paper there was a history of previous multiple pregnancy (5 twin, 1 triplet). There is not the slightest doubt that this number would be much larger were the histories complete in this respect. It is also of interest, as Neugebauer points out, that in a considerable number of cases the combined pregnancy is some form of the triplet variety, i.e., either uterine twins and one tubal embryo, or one uterine embryo with two in one tube, or each of the two tubes. This multiplicity in tubal pregnancies is a well known occurrence, being explained by Arey (2) and others on the basis of the

defective environmental conditions encountered by the tubally implanted embryo

CLINICAL CHARACTERISTICS

It is evident that the clinical picture in cases of combined pregnancy must present the widest variation, chiefly dependent upon whether the uterine or the extra uterine pregnancy dominates the picture. On this basis we may describe the following chief groups:

Cases with history suggesting ectopic pregnancy. For reasons which are evident, these cases make up the great bulk of those observed in early pregnancy as can be seen from a glance over the case records I have collected. Of the two concurrent gestations it is the one in the tube which practically always gives the first significant symptoms because of the well known tendency of the tubal gestation to rupture or to abort at a very early stage. For this reason almost all cases in which the tubal pregnancy thus terminates come to operation although usually without recognition of the uterine gestation. Since it is uncommon for the tubal condition to advance much beyond the early months, it follows that this group is much larger than the one next to be described.

As a rule though not always, there has been a short period of amenorrhœa followed commonly by uterine bleeding. Pain in the affected side, faintness, perhaps rapid pulse and nausea have often been noted. Pelvic examination in practically all the cases has shown a unilateral mass so that the diagnosis of extra uterine pregnancy has been a more or less compelling one. And practically always the diagnosis has been proved to be correct. In many of the cases the uterus at operation was found to be so definitely enlarged as to leave no doubt as to the co-existence of uterine pregnancy while in others this was not suspected until much later, or until an abortion had occurred.

I have personally been especially interested in the behavior of the menstrual periods in these cases of combined pregnancy. Unfortunately, only a small proportion of the authors give satisfactory menstrual histories, and some give none at all. I have elsewhere (25) urged the view, supported by clinical observation, that the bleeding in cases of tubal pregnancy,

aside perhaps from a slight show now and then, dates from the death of the embryo. Generally speaking the cases of tubal pregnancy in which there is no bleeding are those in which the embryo is still living. When, therefore, bleeding is absent in a case of combined pregnancy it would seem likely that at least one of the embryos is still living exercising its protective influence upon the uterine decidua and thus preventing bleeding. In one of my own cases this was well borne out the patient having all the symptoms of ruptured tubal pregnancy, with severe abdominal hæmorrhage but with not a drop of external bleeding. The recent case of Curtis (Case 16 of this series) was almost identical. It is true that in a few cases in the literature some bleeding appears to have been noted in cases of this type but in these there is doubt as to whether or not the intra uterine fetus was still living. It is possible, too, that the death of one embryo usually the ectopic is at times more than sufficient to counterbalance the protective or inhibiting influence of the surviving one. At any rate this general principle, which is borne out in tubal pregnancy, probably applies also to the special type represented by combined pregnancy.

Cases in which the intra uterine pregnancy dominates the clinical picture. For reasons which have already been indicated it is chiefly when the tubal pregnancy advances beyond the early months that the synchronous growth of the uterine pregnancy leads to its ready recognition. There are of course a certain number of cases in which in spite of tubal rupture, the uterine condition advances to full term. Many of these pass altogether unrecognized, ending in spontaneous resolution if the pregnancy be early. Others in a later stage terminate with maceration, mummification, or lithopedion transformation of the fetus which thus may be retained for very long periods.

Finally, there is a group of cases in which both pregnancies advance to full term ending at times in the birth of two live babies one from within the uterus and one from without. Such deliveries are, of course always operative, for the extra uterine child and usually for the intra uterine baby as well. In the 76

cases herein surveyed, 9 extra-uterine babies have been delivered alive at full term, all by laparotomy (Chrobak, Moore and Sale, Strathy, Wilson, Miller, Rumford, Bogdanovics, Du Bose, and de Araujo). The case of Du Bose (Case 11 of my series) may be taken as fairly typical of this group. His patient, a colored woman of 35 gave birth to the intra-uterine baby, after which the midwife, recognizing the presence of a second baby, which she could not deliver, called the physician. An abdominal section was done, delivering the second child from a large right-sided sac. Both babies were well 22 months later. The more recent case of de Araujo (Case 30) was somewhat similar. In addition to these 9 cases, Nebesky (23) reported one in which the extra uterine fetus was delivered alive at the seventh month, succumbing after 30 minutes.

There is a considerably larger group in which both pregnancies continued to full term, with delivery of the live intra uterine fetus and the operative removal, often at a considerably later period, of the dead extra uterine embryo. One of the most interesting of these was reported by Royster (29). In this case the extra uterine fetus was alive and active in its movements immediately after the delivery of the uterine baby, but operation was declined until 23 days later, after it had succumbed. It was then removed by abdominal section.

DIAGNOSIS

In Neugebauer's first series of 170 cases the diagnosis had been made pre operatively or antepartum in only 7 cases (4.0 per cent). In his second series of 74 cases, a correct diagnosis was made in 8 (10.8 per cent). In the additional group of 32 cases which I have collected, the diagnosis was made in 3 (9.3 per cent), so that it would seem that there has been little improvement in this respect. In cases observed in the early weeks of pregnancy, the common error is to overlook the intra uterine gestation, as it is the extra-uterine which produces the significant and often urgent symptoms. Slight enlargement of the uterus may be noted in association with an uncomplicated ectopic pregnancy, but in my experience this is rarely striking and often

absent, largely because most ectopic pregnancies come under observation only when the tubal pregnancy process has been terminated, as indicated by the occurrence of continuous uterine bleeding. The uterine decidua has usually been cast off and the uterus therefore shows no appreciable enlargement. If, therefore, very definite uterine enlargement can be made out in a case which otherwise suggests ectopic pregnancy, the possibility of the combined condition should be borne in mind. This is especially true if there is no external bleeding. The uterine bleeding of ectopic pregnancy is usually scanty, so that if very profuse hemorrhage occur, one should think of the possibility of abortion of a uterine pregnancy in association with the ectopic process. It was this occurrence which gave us the clue in one of the 2 cases I am reporting here.

In the late cases, as already stated, the picture is that of a uterine gestation with symptoms of greater or less severity, pointing to trouble in one side of the pelvis. The exact diagnosis is obviously difficult, because of the fact that similar symptoms may often be seen with such complicating conditions as appendicitis, torsion of adnexal tumors, etc. If evidence of internal hemorrhage is conspicuous among the symptoms, the suspicion of ruptured ectopic pregnancy becomes much stronger.

TREATMENT

The treatment, of course, must be adapted to the indications of the individual case. As already stated, it is the rupture of the extra-uterine pregnancy which produces the presenting symptoms in the largest number of cases. This occurs almost always in the early months of pregnancy. Laparotomy would be indicated in such cases even were the association of intra uterine pregnancy recognized. Commonly it is not, but fortunately the error is rarely disastrous, as laparotomy should be done in any event. In the occasional case, abortion of the intra-uterine pregnancy has already occurred, though not recognized. If continuous and free bleeding continues and is associated with the presence of a unilateral mass, it is well to precede the laparotomy by the performance of curettage, with micro

scopic examination of the curettings. The operation should be done gently, so as not to start intra abdominal bleeding. The finding of villi of course settles the diagnosis of a recent intra uterine pregnancy. The extra uterine pregnancy is then managed along the usual surgical lines.

Much more difficult though fortunately much less frequent are the cases in which the pregnancy has advanced to a later stage before toward symptoms develop. If death of the extra uterine embryo can be established which will rarely be the case the treatment is the same as that in the early stages i.e., laparotomy with removal of the ectopic pregnancy. So far as I know it has not been possible in any reported case to diagnose the presence of a living intra uterine and a living extra uterine baby in late pregnancy or at term before the onset of labor. It is not until the birth of the uterine child that the presence or location of the extra uterine is recognized. Expectant treatment would seem justified in cases in which two live embryos are recognized in the later months with the performance of abdominal section as soon as labor sets in. Certainly an attempt to deliver the intra uterine child through the natural channels would be associated with considerable hazard to both of the children and also to the mother although as mentioned above spontaneous delivery of the living uterine child has, in a few unrecognized cases preceded the operative removal of the living extra uterine child.

SUMMARY

Thirty two cases of combined simultaneous intra uterine and extra uterine pregnancy are collected from the literature from 1913 to the present. These include 2 new cases observed by the author. These added to the 244 cases collected by Neugebauer in the literature from 1708 to 1913, bring the total to date up to 276. Clinically, two chief groups are encountered. In the early cases representing the great majority, the picture is commonly that of a ruptured tubal pregnancy while the uterine gestation is not recognized until operation or at a later stage. Occasionally however, it is the uterine gestation which is recognized in

the early months, the extra uterine not precipitating severe symptoms until later. Cases which are first seen in a later stage of pregnancy have commonly been looked upon as cases of normal pregnancy until the occurrence of the extra uterine symptoms. Finally, in some cases both pregnancies have advanced to term and in 9 of these both children have been delivered alive.

The treatment is dependent upon the indications of the individual case. In early cases usually those with extra uterine symptoms the treatment is laparotomy. In the later cases the same plan may be advisable although at times toward the end of pregnancy expectant treatment is justified until the onset of labor, when operative removal of both fetuses is indicated.

CASE 1 Clavier (7 1913) The patient entered the surgical clinic on January 20 1913 with the statement that she had had pain in the lower abdomen and vomiting since January 11. There were chills loss of blood and fetid discharge.

She had menstruated regularly at the age of 15 and until the age of 24, when she gave birth to a living child. After that the menses occurred every 3 weeks. At entry the patient had fever she was emaciated, had pain on suprapubic pressure soft open cervix uterus in normal position but enlarged. Nothing was felt in the cul de sac of Douglas. Diagnosis of placental retention following abortion was suggested and curettage made.

When the uterus was emptied placental shreds and purulent fetid fluid were found. Hot uterine douches and applications of chloride of zinc were followed by draining and iodoform tampon. The temperature did not drop remaining around 37-38.5 degrees C.

On January 6 abdominal pain recurred which became severe on February 12 in the right side where a slight swelling was felt in the cul de sac. The diagnosis of pelvic phlegmon or hæmatocele was made. A test puncture produced blood. Then laparotomy was done. There was a severe peritoneal reaction. The small intestine was found adherent to the abdominal wall and was ruptured. Later the bladder also ruptured.

In the mass some blood and clots and false membranes were found. The right tube was distended and was removed after its pedicle was ligated.

CASE 2 Weiss and Sencert (35 1913) This same case is also reported by Fingova in her Thesis Nancy 1913. Patient aged 38 years, had menstruated at the age of 13, regularly, but menses became painful after marriage. Six years ago she had Bartholin's cystitis and since then leucorrhœa. The first confinement occurred 20 months ago, with normal delivery.

on February 5, 1913. At examination the patient had abdominal colic and hemorrhage. She did not know that she was pregnant. She aborted a fetus three months old, 10 centimeters long. On the twelfth day she had slight hemorrhage, on the thirteenth day severe pain in the lower abdomen on the right side. The pulse was small 120, temperature 36.5 degrees C with vomiting. In the posterior cul-de-sac there was a tumor, tender to touch.

The diagnosis of retro uterine hamatocele, following tubal abortion, was made. Colpotomy was resorted to and dark blood evacuated. The patient again had abdominal pain and laparotomy was done a short time after.

CASE 3 P Fabris (14, 1913). Patient was 26 years old, secundipara, who menstruated at the age of 14, regularly until 20 months previously when a forceps delivery was done. Then the menstrual flow ceased for 10 months, after that it was for 3 months regular and then stopped without the patient noticing any other symptoms. Later backache set in, which stopped spontaneously. After the flow had been absent for 1 month pain in the left lower abdominal quadrant set in, then pain in the epigastrium and vomiting. The abdomen enlarged.

During the 20 days previous to admission she had sacrolumbar pain. The uterus was found increased in size to three finger breadths above the symphysis pubis, slightly displaced to the right. The cervix was soft. A swelling in the fornix adhering to the body of the uterus was discovered. On palpation of the left inferior quadrant a swelling filling the small pelvis was found. A macerated fetus of 3 months was expelled. There was some fever during the next days. After one week the uterus was in a state of involution. The swelling in the fornix was still felt. It was elastic and painful to pressure. Exploratory puncture of the fornix evacuated a coffee brown fluid, in which the microscope showed blood cells. The diagnosis of retrodisplacement of an incarcerated pregnant uterus was made, though a uterine fibroma complicated by pregnancy was taken into consideration.

It was found that this pregnancy had nothing to do with the uterus. The retro uterine hamatocele was well absorbed. I have admitted this report only because of the strongly confirmatory nature of the history.

CASE 4 Demeln and Keim (11, 1914). A Russian, aged 22 had menstruated regularly since the age of 14. She was married July 20, 1911. The last menstruation was on September 23, 1911. Movements were evident in February 1912, at the time when they would be expected, lasting 3 months, the probable term being in May. In March there was abortion when a 7 months fetus was found in a transverse position with false labor manifestations. The abdomen then diminished in size and colostrum appeared. In February 1913 the roentgenogram showed fetal retention.

Artificial dilatation was resorted to. Pain and bloody discharge lasting 24 hours followed. Four

weeks after the patient left the hospital, without heeding advice for operation the menses recurred for the first time, lasting 6 days, then they appeared on May 25-30 and July 2-8. At the end of July the patient vomited and was drowsy. The abdomen increased in circumference. In October a mobile, irregular mass was felt in the abdomen, the cervix toward the right. An ovoid mass was in the left iliac fossa, the size of a 3 months' fetus.

The lithopedion was seen in the roentgenogram. The extra uterine mass was displaced toward the liver. Distant heart sounds were heard in the median line. The cervix had retained its length. On March 14 the patient had labor pains and loss of fluid. A child of 2,850 grams was delivered by forceps. The uterine pregnancy continued to 8 months' maturity with a lithopedion of 30 months. The patient refused removal.

CASE 5 F Primars (26, 1914). In Primars's first case, the patient, aged 31, had had 6 spontaneous deliveries with no puerperal fever. The last child was 9 months old.

The consultation was in January, 1921. The last menstruation had been in December. The patient had fallen recently, and since then had pain in the abdomen with hemorrhage. The cervix was found lacerated, the uterus retroflexed. In the left appendage was an immobile tumor the size of a small fist. After operation the condition was good.

March 26 the uterus was of the size of a 3 months' pregnancy. Slight hemorrhage continued. Then uterine pregnancy was suspected. On April 26 incipient abortion occurred. On April 27, after the tampon was removed, there was expulsion of a fetus 17 centimeters long.

CASE 6 Primars (26). The patient, aged 26 was admitted May 28. She had had two deliveries the first accompanied by placenta accreta and hemorrhage, the second with breech presentation and placenta accreta, endometritis, and parametritis.

She missed menses 5 weeks previous to admission and had had severe abdominal pain in the right side for the last few weeks. On admission a ruptured extra uterine pregnancy was diagnosed.

At laparotomy a fetus 5 centimeters long was found in the right tube, over 2 months old. On June 20 the patient was readmitted. Incipient abortion was completed with instrumental evacuation of the uterus. A fetus of 3 months was found. This was a case of uterine pregnancy with tubal rupture and uterine pregnancy.

CASE 7 Gibson (16, 1914). The patient, aged 36, married 14 years, had had 6 children and 2 abortions. The youngest child was 3 years old. Abortion of 4 months had occurred in September, 1912, and of 6 months, in August, 1913.

November 26, 1913, she stated that she had not menstruated since September 17, 1913. Pain in the right lower abdomen had extended to the back for the last 10 days. There had been no hemorrhage. The uterus was enlarged, softened, and anteflexed. On the right side there was a tumor the size of a

ben s egg tender to touch and not pulsating No resistance was felt in the Douglas pouch The tumor was mobile Resistance developed later in the Douglas pouch There were periodical attacks of acute pelvic pain Gibson diagnosed tubal pregnancy complicating an intra uterine pregnancy as he had never yet felt any softening of the uterus sufficient to make it feel cystic or any marked enlargement of the uterus in cases of tubal pregnancy

When the abdomen was opened free blood was found in the pelvic cavity and clotted blood in the Douglas pouch The tube was enlarged and the uterus pregnant The tube was removed

CASE 8 Bogdanovics (5 1914) The patient aged 28 menstruated at the age of 15 and regularly thereafter every 4 weeks She had had 2 previous pregnancies, the first being twins of heterogeneous sex and ending at the eighth month The second pregnancy was normal The last menstrual period was February 17 1913 In the second month of pregnancy fainting spells and abdominal cramps occurred The cramps periodically recurred until fetal movements were perceived then the patient felt perfectly well On October 6 the patient was delivered of a live baby 45 centimeters long, weighing 2 030 grams One hour after childbirth she experienced crampy pains similar to labor pains and also felt fetal movements Similar pains were felt the next day She entered the hospital 18 days after childbirth where extra uterine pregnancy with living fetus was diagnosed On October 28 laparotomy was done with removal of living fetus (same sex) 45 centimeters long 2 040 grams in weight The child however died a few moments after operation

Bogdanovics mentions also 3 other Budapest cases those of Ligeti Doktor, and Rosenberg The first two however, are included in Neugebauer's first series and the third in his second series

CASE 9 Tandberg (34 1915) A patient 29 years old entered the clinic July 4 1913 She had always been well, and had had 2 children 4 and 6 years old with normal births Menses had always been regular but varying from 4 to 6 or 7 days The last menses occurred at the beginning of April Recently she had had abdominal pain flatulency, and headache At the hospital the pulse was found to be small 120 rectal temperature 38.2 degrees C The uterus was anteverted and hæmorrhage passed from the cervix Ruptured extra uterine pregnancy was diagnosed and laparotomy done

The extirpated tube with its placenta was examined at the pathological institute The tubal tract was normal chorionic villi were numerous and lined with Langhans cells and syncytial bodies There were typical decidual cells On the nineteenth day after operation there was slight hæmorrhage On February 17, 1914 the patient was delivered of a fetus 54 centimeters long weighing 3 4 kilograms

CASE 10 W D MacFarlane (20 1915) A patient, aged 29 had had hæmorrhage and severe abdominal pain for 12 days The menstrual periods had always been normal except for 2 years of

amenorrhœa The last menstrual period was on August 23 She was admitted on October 2 There had been no former pregnancies The pain was severe in the right iliac region The attack lasted 1 hour and then the patient was faint and sick Another severe attack occurred 6 days later and lasted for 8 hours After the first attack there were slight hæmorrhage and discharge which continued, with furthermore, rectal tenesmus frequent micturition and anæmia The abdomen was distended and tender In the right iliac region was a dull percussion sound A nulliparous cervix and an enlarged uterus in retroposition were noted The Douglas pouch was filled by tender semi fluctuant swelling Per rectum a bulging swelling was felt which was exquisitely tender to pressure

After a subumbilical incision much blood was found in the abdomen The right tube was of the size of a walnut and, with the ovary was imbedded in a clot of dark blood The pathologist found an incomplete tubal abortion The left ovary was cystic and contained a corpus luteum The right ovary also contained a large corpus luteum The pregnancy continued satisfactorily to term

CASE 11 F G Du Bose (12 1915) A colored patient aged 35 had had 7 children 6 of whom were living She had had no miscarriages the last confinement was January 10 1913 A child was born at noon The midwife recognized the presence of twins and made futile efforts at delivery The physician diagnosed viable abdominal pregnancy In the evening an abdominal section was made The fetus was taken from the large right ovarian amniotic sac The child weighed 2 ounces more than its sister which had been born at noon The pedicle started at the upper posterior surface of the right broad ligament It was ligated and a few omental adhesions to the gestation sac severed The abdominal incisions were closed with catgut and silk worm Both children were well after 22 months

CASE 12 J Heyman (17 1915) Heyman's first patient aged 31 had had 2 normal pregnancies the last 5 years ago The menstrual periods had been of 4 days duration, the last normal one occurred October 14-18 In November there was slight hæmorrhage for 11 days The patient considered herself pregnant Slight bloody discharge was noted on November 25 and severe pain on December 9 The pulse was small 140 temperature 3, 3 degrees C Dullness was found on both sides and a tumor in the Douglas pouch, tender to touch The patient was anæmic The diagnosis was intra uterine and ruptured extra uterine pregnancy or intra uterine pregnancy complicated by abdominal affection and diffuse peritonitis shock and possibly torsion of an ovarian tumor Upon laparotomy on December 11 blood was found in the abdominal cavity and an early pregnancy in the uterus A mass which started from the lower border of the round ligament at the point where the tube starts was removed with a portion of the tube On January 4 the pregnancy was progressing

CASE 13. Heyman. Heyman's second patient aged 23 had had normal delivery 6 years previously. She had previously had a pelvic inflammation. Menstruation had been regular every 4 weeks lasting 3 to 5 days until October 14. In November there had been slight loss of blood on December 14 a "lump" and blood was passed after 5 days of severe pain and on December 15, a renewed attack of pain and hemorrhage occurred. The cervical canal was closed. There was dullness in both sides.

The diagnosis of extra uterine pregnancy and peritubal hamatocele with fresh hemorrhage into the abdominal cavity was made. Laparotomy showed peritoneal hamatocele with placental formation.

CASE 14. H. J. Boldt (6, 1917). In a patient, aged 38 with a child 10 years old, the uterus on October 31, was found to extend to midway between the symphysis and umbilicus. Behind it was a large fluctuating tumor, the character of which was not determined. The uterus showed the usual signs of pregnancy. Hemorrhage and placental fragments presented. The embryo had been expelled previously. November 2 the incomplete abortion was completed with a dull curette. Upon incision dark blood was evacuated from the cul de sac. At that time the thought of simultaneous extra uterine and intra uterine pregnancy arose. When the abdomen was opened an embryo with its placenta was found attached to the right tube and the broad ligament. As patient desired offspring no operation was performed. The woman died of sepsis.

CASE 15. E. A. Sullivan (33, 1917). A tertiary gravida, aged 42, on May 6 1916 while doing house work, had sudden agonizing pain referred to the diaphragm. She had a pale pinched expression with pulse 160 and dicrotic. The temperature was subnormal. The uterus was somewhat enlarged the cervix elongated the external os patulous. A serous bloody discharge was present. Nothing abnormal was found in the cul de sac suggesting ruptured pregnancy.

At operation the pelvis and cul de sac were found filled with clotted blood and a fetus. Both were removed and the bleeding tube ligated. During operation pressure on the uterine wall outlined a fetus in the uterus and led to a diagnosis of multiple pregnancy. December 24 a boy weighing 11 pounds was born.

CASE 16. A. H. Curtis (9 1918). The specimen was presented at the meeting of the Chicago Gynecological Society, January 18 1918. The patient 33 years old, had always been in good health and had one daughter 11 one 7 years, both by normal births.

Menstruation had been of the 28 day type regular, and normal in amount. The last normal period October 30 occurred 2 months before the operation was done. Amenorrhoea was accompanied by the usual signs of pregnancy. Two weeks previous to consultation sudden agonizing pains in the left side of the abdomen were followed by pallor

and thready pulse. The abdomen was tympanitic, containing a boggy mass arising a hand's breadth above the symphysis. At operation 2 litres of free blood were found in the peritoneal cavity. The left tube was bleeding profusely from a ruptured pregnancy in the isthmic portion. The tube was ruptured so completely that only a small bridge of the wall remained. The uterus contained about a dozen fibroids. An intra uterine pregnancy was easily diagnosed at the time of operation.

Only one corpus luteum was found in the right ovary, on the side opposite the tube containing the pregnancy. A supravaginal hysterectomy was done with removal of the left tube and ovary. The patient had almost completely recovered from the operation at the time of the report.

CASE 17. M. Fenger (15, 1910). A woman 38 years old was taken to the hospital on December 18. She had been treated for pleuropneumonia following embolus in the pulmonary artery. She had 7 living children and had had 2 abortions. Menses had always been regular until 8 weeks before. She considered herself 2 months pregnant. Ten days before the entry into the hospital she had had severe pain in the iliac fossa. The temperature was 38.3 degrees C. Anemia was associated with vaginal hemorrhages. The uterus had the aspect of a 2 months pregnancy. The appendages could not be palpated. There were clots in the Douglas pouch. On December 4 laparotomy was done and the lower abdomen found full of blood and a tubal pregnancy. Eleven days after the operation a phlebitis developed in the arm and 2 days later severe dyspnoea and cyanosis pulse 130-140 and pain in the lower abdomen with hemorrhage. The vagina was full of clots. In the extra uterine specimen chorionic villi had been found. Patient dismissed improved.

CASE 18. K. Hornung (18 1906). The patient had always been in good health and had menstruated at 14 regularly 5 to 6 days. She had one child delivered spontaneously in 1896. In 1907 she had an abortion of 3 months.

She entered the hospital but when the child was not born at term she did not heed the advice for an operation. The menses reappeared and the circumference of the abdomen diminished. A few weeks later she entered the hospital again. A child was extracted and the uterus contracted after delivery and expulsion of the placenta. Then a tumor was felt on the left side of the uterus. Although she was advised to have an operation for an ectopic pregnancy she left the hospital. Ten weeks later laparotomy revealed pus and a macerated fetus.

CASE 19. Stropeni (32 1920). The patient was 37 years of age. Menstruation had always been regular. Eight years before a pregnancy had been interrupted at 1 month. Two years later she was infected with gonorrhoea and was treated subsequently for right sided salpingitis. She often had attacks of pain extending to the right iliac fossa. The last menstruation had been in May 1920, then she missed one flow in June. Soon after that she

had severe pain in the lower abdomen slight bloody discharge and vomiting July 1 a physician diagnosed 40 day pregnancy which was discredited by another doctor soon after. The uterus was found displaced toward the left side. Anæmia was noted with pain in the lower abdomen thirst heaviness in the perineum temperature of 38 degrees C small frequent pulse until July 20. She lost consciousness and the abdomen was tender with tympanites.

Vaginal palpation revealed a mass in the Douglas pouch. The uterus could hardly be distinguished. It was pushed to the right. On July 17 a median incision was made and bloody discharge and clots removed. The colon and ileum were blocked and adherent to the right tube. At the back was a rupture. The specimen showed a ruptured tubal pregnancy and the uterine pregnancy of 5 months was diagnosed after one month. On February 28 labor pains set in and on March 3 a mature child weighing 3700 grams was extracted.

CASE 20 C M Rolston (27 1921). The patient aged 29 multipara was admitted November 10 1919 with acute abdominal pain rapid pulse and faintness. She had missed two menstrual periods. There was a tender swelling in the left iliac region and an occasional slight rise in temperature. December 4 at operation fresh blood was found in the peritoneal cavity from a rent in the left fallopian tube. Evidently a second rupture had just occurred. The left tube was ligated and excised the left ovary was removed as it was cystic.

The excised tube contained a fetus 6 weeks to 2 months old. The uterus seemed larger than it is generally in these cases. On January 10 1920 she was delivered of a healthy child.

CASE 21 A Sippel (31 1922). The patient aged 39 had always been healthy. She had had a right tubal abortion of months. Nine years ago she had had one spontaneous delivery. Menses had always been regular the last 7 weeks ago. At examination the author was surprised to find a simultaneous intra uterine pregnancy of the same age. There was a cyst in the ovary the size of a hen's egg on the pregnant side. The ovary was covered with blood clots and therefore could not be palpated. The tube and ovary were removed. The abdominal cavity was rinsed with saline solution. The intra uterine pregnancy progressed well to full term June 1 with spontaneous delivery.

In the removed tube a pregnancy was found in the ampullar portion. No corpus luteum was discovered in the ovary therefore both ova must have been derived from the left ovary. After birth the menses were regular until July 17 1921. On August 17 1921 the woman was operated upon for a 7 weeks ruptured left tubal pregnancy. No adhesions were found.

CASES 22 and 3 Colistro (8 1922). Two cases are reported. In both of them uterine abortion occurred at the second or third month followed by a continuation of hæmorrhage pain and other symptoms which were explained at laparotomy by

the finding of tubal pregnancy. In 1 of these 2 cases the patient had lost a great deal of blood at the abortion and died soon after the laparotomy. In the second the ectopic gestation was suspected from the signs of internal hæmorrhage although only a few days had elapsed since the abortion. In a third case there had been a diagnosis of fibroid tumor complicating pregnancy but the operation showed the condition to be a pregnancy in the cornu of the uterus. As far as can be gathered from the abstract of the third case which alone has been available to me there was not an additional uterine pregnancy.

CASE 24 Berry (4 1923). Patient aged 26 was admitted to the hospital on October 22 1922 with a diagnosis of ectopic pregnancy. Boy twins were born 5 years ago and another boy 3½ years ago. An aunt had had two sets of twins.

On July 7 1921 she had been curetted following a miscarriage. Menstrual flow started one month after the operation lasting 5 days instead of the normal 3 with discomfort and pain. One month later bloody discharge was associated with severe abdominal pain sacral backache tenderness in left lower quadrant and rigidity. Vaginal examination showed a mass in the Douglas pouch extending to the lateral fornix.

At operation on October 25 1922 the left tube was found distended the ampullar portion contained blood clots which had evidently ruptured through the ostium forming an incomplete tubal abortion. The blood clot had become partly organized and the raw surface left after its removal was covered by bringing part of the mesosigmoid over it. The uterus was the size of a 3 months pregnancy. The left ovary was normal. The right ovary contained a cyst of lutein type containing clear fluid. A normal looking corpus luteum was contained in the section.

On the 27th the patient began to lose blood and on the 31st a 3 months embryo with complete membranes was expelled through the vagina.

CASE 25 Auvray and Delator (3 1923). The patient aged 34 had a child aged 15 which had been born without artificial aid. When 33 she had had a second confinement the child being 8 months old. Previous to the last confinement she had been treated for metritis.

Menstruation had been regular but advancing constantly. The last menses had been September 2 to 6 and she had missed in October. Then she experienced sudden severe pain in the lower left abdomen with bleeding until November. Then she lost some clots. On October 20 she had had severe pain radiating to the anus with tenesmus and burning in the iliac fossa.

A hard mass was found in the posterior cul de sac the size of an orange. The external os was open and pointed forward. The diagnosis of hæmatocele following rupture of an extra uterine pregnancy was made. The night before the operation a small fetus was expelled which was found to have come from

the left tube which ruptured into pouch of Douglas and adhered to the bowel. The uterus was large and fibromatous. Subtotal hysterectomy was done. The specimen showed villi in the uterus.

CASE 26 J. M. Keves (19, 1923) The patient, 29 years old, had had 2 children, the youngest aged 20 months. Menstruation began at 14 years of age and was of the 28 day type, with no pain lasting 3 to 4 days. The flow lasted one day in May and one week in June with cramps and nausea.

The uterus was found enlarged and there was a tender mass on the right side, in the cul de sac. Tentative diagnosis of right tubal pregnancy was made. Curettement caused active hemorrhage and produced expulsion of placental tissue. Then the suspicion of intra uterine pregnancy arose and laparotomy was done. The uterus was tilted to the left and was found to be the size of a 3 months gestation. The left tube and ovary were normal. Free blood was found in the abdominal cavity, with clots. Three days later fetal bones were found in a clot. The placental membranes were removed. The specimen of blood clot contained numerous chorionic villi. Another specimen of the fallopian tube showed poorly organized blood clot with chorionic villi, the ovary showed slight fibrosis with a recent corpus luteum and follicle cysts.

CASE 27 Matthews (21, 1924) The patient, aged 26 had menstruated regularly every 28 days except in April when she menstruated twice on the 2nd and 15th. She skipped May 12. On May 19, slight dark brown and red discharge started with soreness in the abdomen and continued until May 25. Then severe pain set in in the lower left abdomen for 40 hours, with vomiting and fainting. Four days later there was a second attack. The uterus was enlarged, the cervix softer than normal. It was hard to examine the patient on account of the soreness. A threatening abortion was suspected. On June 3 there was another attack of pain, and on June 9 continued bloody discharge. An operation removed clotted blood and the left tube ruptured at distal end. The uterus was the size of a 2 months pregnancy. One month later pregnancy in uterus was evident.

CASE 28 Angeli (1, 1924) The sixth case of a series of 9 extra uterine pregnancies reported by this author is one of tubal pregnancy combined with uterine gestation. Complete data are not given, but the author states that from the uterus there was removed a small embryo measuring a few millimeters, while at laparotomy after rupture of the right tube, a fetus 15 centimeters long weighing 135 grams was found. He states that there was a history of distinctly different periods of cohabitation and considers the case as one of superfetation.

CASE 29 Nash (27, 1924) The patient aged 31, was admitted to the hospital on June 12, 1923. She had 2 children, 3 years and 13 months old respectively. Nine weeks had elapsed since the last period. On June 11 sudden pain was felt in the right lower abdomen, with nausea, vomiting, and fainting. The pulse was 136 the abdomen distended and rigid.

A median incision below the umbilicus was made. In the cavity were blood clots and a ruptured sac with projecting membranes in the upper corner of the uterus. It seemed impossible to excise the mass. Supravaginal hysterectomy was done.

The specimen was a uterus enlarged to the size of 10 weeks pregnancy. Behind the entrance of the right fallopian tube into the uterus was a swelling which had ruptured and from which chorionic tissue protruded. Attached to it and overlying it a $\frac{1}{2}$ inch mass of chorionic tissue formed a wall and a cavity one inch in diameter. This cavity was lined with smooth membrane and from it projected a filament, probably the umbilical cord. The uterus was 4 by 4 inches (pregnant).

CASE 30 Dr I. de Araujo (10) in 1925 reported to the National Academy of Medicine the case of a patient recently operated on by him at the Santa Casa Maternity hospital. A primipara aged 29, suffered blood losses up to the third month. The increasing pains in the lower part of the abdomen almost entirely prevented her resting. On reaching the hospital she was already in labor and had passed water and blood. On palpation a head was felt but examination was incomplete because of the pain it caused. The cervix was not dilated. On the morning of the third day another examination was made. The lower uterine segment was distended and thinned and through its walls fetal sutures and fontanelles could be felt. An amputated like uterus at the level of the right iliac fossa a tumor was the cause of the dystocia and suggested a fetal head.

As the cervix remained unrelaxed and the fetus seemed viable a laparotomy was deemed advisable. A pregnant uterus was found and behind another mass which at first sight looked like a fibroid adherent to the neighboring structures. An attempt at freeing the adhesion was made but the mass burst open on one side, and an abundance of blood escaped. The uterus was then drawn out and a live but moribund fetus was found. While the operator was trying again to destroy the adhesions a new fetus appeared. This was located in the right tube and was delivered alive and in good condition. The operation was completed by a supravaginal amputation of the uterus and resection of the right tube and ovary. While the patient did well at first, death ensued suddenly on the fifteenth day. The uterine fetus died in convulsions 24 hours after delivery, but the extra uterine child is still alive and doing well.

CASE 31 Novak (25, 1925) Several years ago I operated on a woman of 35 who had been referred to me by Dr B. S. Rankin, of Tunnelton, West Virginia. She had missed two menstrual periods and had exhibited the usual subjective signs of pregnancy. Several days before I saw her she had been taken with violent pains in the left iliac fossa and had suffered a number of syncopal attacks. There had, however, been no external hemorrhage whatsoever. Examination showed a slightly enlarged uterus and a large sensitive mass filling the left side of the pelvis. In spite of the absence of uterine



Fig 1 Well preserved villi from tubal pregnancy in Case 31

bleeding a diagnosis was made of ruptured tubal pregnancy. At operation the pelvis and lower abdomen were found to be filled with blood the left tube being the seat of a ruptured pregnancy. This was confirmed by microscopic examination of the tube (Fig 1). The patient made an uneventful recovery. About 6 weeks after the patient's discharge I was rather surprised to receive a letter from Dr Rankin stating that the patient had had an attack of uterine bleeding with some pain followed shortly afterward by the expulsion from the vagina of a 3 months fetus. The explanation of the case was then quite clear. The woman at the time of operation had had a combined intra and extra uterine pregnancy the uterus being pregnant at



Fig 3 Degenerated chorionic villi obtained by uterine curetting in Case 32

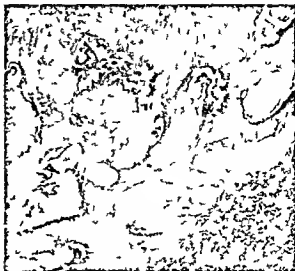


Fig 2 Fairly well preserved villi in lumen of tube from Case 32

the time of the removal of the tube. There was no way for us to determine the existence of the uterine pregnancy at operation. The presence of the live fetus explained the absence of hemorrhage.

This case has been mentioned by the present writer in a previous paper though in another connection.

CASE 32 (Novak). My second patient a white woman of 22 was seen on May 30 1925 in consultation with Dr H E Zepp. The chief complaint was of profuse uterine bleeding which had begun on May 18. There had however been some menstrual abnormality long before this. The menses had first appeared at 12 occurring every 4 weeks lasting 3 or 4 days without clots or pain. In November of 1924 the flow began to be much more profuse lasting 7 to 10 days with moderate pain. Early in February of 1925 the patient was operated upon in another hospital for acute appendicitis and while in the hospital a curettage was performed for the menorrhagia. Menstruation after this was comparatively normal the last period occurring on May 2. On May 18 free uterine bleeding began and had continued up to the time I saw her. Since the beginning of the bleeding she has had considerable pain in left iliac fossa with nausea and faintness at times.

The general condition of the patient was very poor with marked pallor of the skin and mucous membranes as a result of the long continued hemorrhage. The pulse was 100 and the hemoglobin after admission to the hospital was found to be 50 per cent. The pelvic examination showed a rather soft cervix and a uterus which was somewhat enlarged and pushed to the right by a large moderately tender mass filling the left side of the pelvis. The right side was negative. The uterine bleeding was far more abundant than one ordinarily finds with ectopic pregnancy and this with the definite enlargement of the uterus and the softening of the

cervix suggested that there might have been uterine gestation as well as one in the left tube.

The laparotomy was therefore preceded by a curettage which yielded only a moderate amount of tissue, in which there were, however, several chunky particles suggesting placental tissue. Bleeding was extremely profuse so that it was necessary to inject pituitrin and to insert a uterine pack. This pointed all the more to the probability of an incomplete abortion of a uterine pregnancy. Laparotomy was then done. The pelvis contained a mass of old dark blood clots. The left tube was much enlarged and hemorrhagic looking at its fimbriated extremity, from which particles of blood clot protruded. The condition was evidently one of tubal abortion. The left ovary contained a retrogressing corpus luteum. The right tube and ovary were normal. Microscopic examination of the uterine scrapings showed definite chorionic villi chiefly old and fibrotic in appearance (Fig 2). Villi were also found in the tube which had been removed (Fig 3).

NOTE.—Since the writing of this paper the two following cases are available for report, bringing the total up to 278 cases.

CASE 33 This case was reported by Dr John N. Furniss of Selma, Alabama in the discussion of this paper and I am indebted to him for permission to include it herewith. The patient, aged 24, came under Dr Furniss' observation on September 10, 1923, with the classical signs of internal hemorrhage—rapid pulse, shallow respiration, pale mucous membranes, a lemon colored skin and bluish discoloration around the navel. She had had 4 normal pregnancies. The date of the last menstrual period was about August 1, 1923. Since September 1, there had been irregular bleeding with colic like pains in the left lower abdomen. Her physician had diagnosed uterine pregnancy from the enlargement of the womb, the bluish discoloration of the vagina, softening of the cervix, etc., and considered the bleeding as probably due to threatened abortion. On September 10 she became violently ill with agonizing knife like pains in the left pelvis with symptoms of internal hemorrhage and shock. Laparotomy was performed as soon as she entered the hospital. The abdomen and pelvis were filled by a large quantity of old and fresh blood, and there was a rupture of the left tube, with active bleeding. The uterus was enlarged, fluctuating and congested. Left salpingectomy was done. The patient recovered uneventfully. Exactly 243 days from the date of the rupture, the patient was delivered of full term twins, a boy weighing 7¼ pounds and a girl of 7 pounds. There was one placenta and two cords. The interesting features of this case are (1) the known pregnancy within the uterus before the extra uterine rupture took place and (2) the full term delivery of twins making a triplet pregnancy.

CASE 34 (Page and Ferey Bull et mem Soc nat de chir 1925 vi, 781) The patient was a 33 year old

nullipara who came for the relief of pain localized in the right iliac fossa. This first occurred when she was believed to be in the third month of pregnancy. The pulse was 100 and of good quality, the temperature 37.6 degrees C. The abdomen was slightly distended, and there was tenderness in the right lower quadrant, but no rigidity. The cervix was patulous and the uterus was of the size of a two months' pregnancy. A diagnosis of acute appendicitis was made. At operation the pelvis was almost full of blood, from the rupture of a right tubal pregnancy. The right tube was removed. A corpus luteum was found in the right ovary. After the operation, the uterus continued to increase in size 3 months after operation the fetal heart was heard and 7 months after the operation the patient was delivered of a normal child.

BIBLIOGRAPHY

- 1 ANGELI Riforma med 1924 vi 318
- 2 AREY Am J Obst & Gynec, 1923 xxxvi 407
- 3 AUVRY and DELATER Bull et mem Soc anat de Par 1913 xciii 482
- 4 BERRY Lancet 1923 i, 1157
- 5 BOGOSNOVICH Orvosi hetil 1914 lvi, 9
- 6 BOLDT Am J Obst 1917, lxxv 865
- 7 CLAVIERE Normandie med 1913, xlix 198
- 8 COLISTRO Rev med d Uruguay 1922 xiv 47
- 9 CURTIS Surg Gynec & Obst 1918 xxvii 232
- 10 DE ARAUJO J Am M Ass 1925 lxxviii 1319
- 11 DEMELIN and KFM Bull Soc d'obst et de gynec de Par 1914 iii 402
- 12 DU BOSE South M J 1915 viii 784
- 13 FWEBS China M J 1925 xxix 403
- 14 FAARIS Policlin Rome, 1913 sez prat, 947
- 15 FINGER Hosp Tid, 1919 lxi 1113
- 16 GIBSON Tr Roy Acad M Ireland 1914 xxvii, 290
- 17 HRYMAN Hygiea Stockholm 1915 lxxii 529
- 18 KORMUNG Theses Goettingen 1910
- 19 KEYES New York M J 1923, cxviii 611
- 20 MACFARLANE Glasgow M J, 1915, lxxiv 109
- 21 MATTHEWS Med Sentinel 1924, xxvii, 154
- 22 NASH Lancet 1924 i 494
- 23 NEESKY Gynaek Rundschau 1917 533
- 24 NEUGEBAUER, Fr Zur Lehre von der Zwillings schwangerschaft mit heterotopem Sitz der Fruchthe das eine Ei in cavo uteri der andere extrauterin Gelagert Leipzig Werner Klinkhardt, 1907 also Gynaek Rundschau, 1913 vii 809
- 25 NOVAK and DARNER Am J Obst & Gynec, 1925, iv, 295
- 26 PRINSAR Gynaek Rundschau 1914, viii 203
- 27 ROLSTON Brit M J, 1921, ii 323
- 28 ROUVIER Bull Soc d'obst et de gynec de Par 1914 iii 92
- 29 ROYSTER Am J Obst 189, xxxvi
- 30 SIMPSON Am J Obst 1904 xlv, 333
- 31 SIPPPL Deutsche med Wchnschr 1922 lviii i 02
- 32 STROPFEN Ann diostet e gynec, 1921 xliii 837
- 33 SULLIVAN J Am M Ass 1917 lvi, 843
- 34 TANDBERG Norsk Mag f Lægevidensk 1915 viii 317
- 35 WEISS and SENCERT Bull Soc d'obst et de gynec de Par 1913 ii 648
- 36 ZINKE Am J Obst 1902 xlv 623

THE TENDENCY TO ACIDOSIS IN THE TOXÆMIA OF PREGNANCY

PRELIMINARY REPORT¹

By WALTER E. LEVY, B.S., M.D., F.A.C.S., NEW ORLEANS, LOUISIANA.
 Senior Assistant Obstetrician, Tulane Post-Graduate School.

ECLAMPSIA and pre-eclamptic toxæmia are diseases of pregnancy manifested primarily by destruction of liver tissue. The liver is concerned with carbohydrate metabolism and storage. A deficiency of carbohydrates in the body leads to an imperfect combustion of the fats and in turn the production of acetone bodies.

The question of the toxæmia of pregnancy is one that is ever uppermost in the mind of the obstetrician and the therapeutic side of it is purely empirical. Until the specific toxin or toxins are isolated and the etiology of this particular complication is firmly established the treatment of necessity must be in the main, directed toward the symptoms alone.

The author believes, however, that he has definitely established that in the pre-eclamptic state and in eclampsia an acidosis exists. Believing also that a distinct difference exists between pre-eclamptic toxæmia and a toxæmia due to a previous kidney disease he has attempted to classify his cases as such.

Briefly, he has included among those cases of pre-eclamptic toxæmias such as show practically no renal involvement. This has been determined by making use of the phenolsulphonephthalein test, the diastatic activity test of the urine, the approximate estimation as to the relative amounts of serum albumin and serum globulin in the urine, the examination of the urine sediment for the various types of casts, and the chemical examination of the blood (Table I).

With the cases thus divided the blood of the two types was next investigated along with the normal controls. As a result of the examination of the blood of 50 pre-eclamptics and eclamptics it was found that there was a marked decrease in the blood sugar content, a lowering of the carbon dioxide combining power, and practically no change in the nitrogenous constituents. Furthermore in quite a few of the more advanced cases we were able

to demonstrate acetone and diacetic acid in the urine. In subsequent cases a quantitative estimation of the acetone bodies in the blood stream will be made as well as liver function tests. In those cases classed as nephritics neither the blood sugar nor the carbon dioxide combining power was lowered.

EFFECT OF REMOVAL OR DESTRUCTION OF THE LIVER

The part played by the liver in carbohydrate metabolism and the result to this metabolism from its (the liver's) removal or destruction can best be explained by quoting from the articles of Frank C. Mann (1). He states that a plausible explanation of the decrease in blood sugar following hepatectomy in dogs is that it removes either the control of the sugar supply or sugar utilization. Hepatectomy may produce a depletion in the carbohydrate material of the body either directly by removing the chief store of carbohydrates and the place of its elaboration or indirectly by removing a substance which has to do with carbohydrate utilization.

Thus latter possibility might be brought about in two ways: (1) directly by controlling the rate of glucose metabolism or (2) indirectly by controlling the rate of protein and fat metabolism.

Among other facts brought out by Mann are these: (a) The total removal of the liver is followed by a definite decrease in blood sugar. (b) The glycogen content of the muscles also decreases. (c) One of the chief symptoms noted in the experimental animals was convulsions followed by coma.

PATHOLOGY OF ECLAMPSIA

Frank (2) states that in eclampsia some circulating poison produces severe changes that are most marked in the liver. The liver at autopsy shows typical changes. Grossly there is a fatty appearance with hemorrhages

TABLE I

Type of Case	Phenolsulphonethylthaleim test	Diastatic activity	Serum albumin and globulin	Blood chemistry
Pre-eclamptic	Low normal to normal 40%—65%	Normal to high	Globulin +	Nitrogen normal to high normal
Nephritic	Low normal to 40%—	Low	Albumin +	Retention of nitrogenous substances

TABLE II—A RÉSUMÉ OF THE RESULTS OF THE BLOOD CHEMISTRY IN TEN CASES OF PRE ECLAMPTIC TOXÆMIA

Case	Parity	Month	Pressure	PST sb	T N P	Urea Nitrogen	Creatinine	Uric Acid	Dextrose	CO ₂	Diastatic activity of urine
66806	I	8	174	60%	20.64	10.37	1.07	3.45	71	43.8	102
3753	III	Term	170	50%	24.9	12.4	1.42	4.44	58.8	37.4	63
28160	II	6	160	50%	30	15	1.5	2.0	76.0	41.2	20
20566	V	7	150	40%	31.5	15	1.6	4	80	40.3	60
62328	VI	7-1	148	65%	30	15	1.3	4.68	80	37.4	70
50160	I	6-1	154	80%	30	15	1.65	4.4	57.1	30.3	31
35137	VI	Term	210	50%	27.0	12.7	1.5	3.01	66.6	50	80
35017	I	8	155	65%	21.4	12.2	1.5	4.4	85.1	35.6	30
9234	I	Term	146	65%	24	12	1.2	5	83.3	34.7	74
	I	8	160	55%	24	11	1.1	5.1	70.5	15.5	54

Microscopic examination reveals necrotic areas, marked by thrombi within the smaller interlobular portal vessels. The necrotic areas are usually central and consist chiefly of dead liver cells.

That the liver function is seriously impaired is thoroughly demonstrated by the work of Krebs and Diekmann (3). While they state that they are not prepared to draw any definite conclusion from their comparatively small series, their work does show an impaired liver function through the use of the Rosenthal test.

Now, when one stops to consider the work of Mann (4), and then to consider the pathology of eclampsia, the conclusion is most obvious. The analogy is between the removal of the liver in the first instance, and the destruction of liver tissue in eclamptic and pre-eclamptic toxæmia.

As a result of this liver destruction, the metabolism of carbohydrates and the storage of glycogen is seriously impaired. It naturally follows that the blood sugar is lowered, the carbon dioxide combining power is lowered, and the tendency to an acidosis, or an acidosis, results. In some of the more extreme cases, as a result of this imperfect combustion of the fats in the absence of glucose, acetone and diacetic acid are demonstrable in the urine.

In view of the facts stated, the rationale of giving glucose or glucose and insulin in pre-eclamptic or eclamptic toxæmia is evident. I

also would like to emphasize that the total elimination of protein from the diet of this type of patient is not only not essential but undesirable. The fats are the elements that should be eliminated.

Table II is a resume of 10 of the 50 cases. It shows (a) that the nitrogenous elements of the blood are altered very little, if any at all, (b) that the phenolsulphonethylthaleim test results in a normal reaction, (c) that the blood sugar is lowered, (d) that the carbon dioxide combining power is lowered, (e) that the diastatic activity of the urine is raised.

CONCLUSIONS

The toxin of eclampsia produces definite destruction of the liver lobules.

The destruction of liver substances causes a derangement of the carbohydrate metabolism and glycogen storage.

The blood sugar and carbon dioxide combining power are lowered.

A state of acidosis is either imminent or present.

The rational treatment is with glucose and insulin.

The author wishes herewith to express his thanks to Marion Pfeiffer Abramson, B.S., for her aid in the laboratory.

BIBLIOGRAPHY

1. MANN, F. C. Collected Papers of the Mayo Clinic 1922
2. FRANK. Gynecological and Obstetrical Pathology 1922
3. KREBS and DIEKMANN. Am. J. Obst. & Gynec. 1924

INTRADERMAL SALT SOLUTION TEST IN NORMAL AND TOXAEMIC PREGNANCIES¹

A DIAGNOSTIC AND PROGNOSTIC AID

By ABRAHAM F. LASH, M.D., CHICAGO

Assistant Professor of Gynecology, University of Illinois

WORKING with the intradermal salt solution test which they first described in July 1923 McClure and Aldrich (6) obtained results which suggested its value as a method of detecting and following the progress of disturbed water balance in the tissues. They found that when 0.2 cubic centimeter of an 0.8 per cent aqueous solution of sodium chloride was injected intradermally the resulting wheal disappeared more quickly from the skin of oedematous parts than of normal. Further investigations by them (2) revealed that this test was of value in determining the immediate prognosis in cases of nephritis with generalized oedema. They found that a decrease in the disappearance time preceded other clinical evidence of oedema by several days and that in certain improving oedematous patients an increased disappearance time occurred before the oedema showed any apparent decrease. They suggested that the rapid disappearance of the wheal (produced by the injected salt solution) indicated an increased affinity of the tissue for water and that this change in the tissue affinity might be assumed to be due to a general intoxication involving the tissues in these cases. They interpreted their results as being a confirmation of the theory that the tissues take an active part in producing these oedemas.

Baker (3) made the test in patients with scarlet fever and diphtheria and found a reduction in the disappearance time which paralleled the severity of the intoxication. He found the test of prognostic value in these cases. In his series palpable oedema was present in only one instance. A shortened disappearance time with a slow return to normal after the crisis was observed by Harrison (5) in children with lobar pneumonia. She suggested that this indicates an intoxication of the tissues more persistent than that ordinarily considered to be present in these cases.

The presence of oedema in late pregnancy is common and when this becomes marked and associated with certain other symptoms the clinical picture of the late toxemias of pregnancy is recognized. Zangemeister (9) showed statistically that oedema is prevalent late in pregnancy and especially in the toxemias of this period. However cases of toxemia of pregnancy occur without oedema. Plass and Bogert (7) found that in the late toxemias of pregnancy the degree of plasma dilution varied directly with the amount of clinical oedema which was apt to be less marked in the patients who developed general convulsions than in those who did not. This latter observation led them to suggest that oedema may be a protective mechanism against some general cellular poison developed under certain conditions during gestation. Aldrich (1) has also discussed a possible protective function of oedema in nephrosis.

Despite the great importance of prophylaxis and early treatment in the toxemias of pregnancy, the diagnostic methods are not always adequate for detecting the beginning toxemia nor can the immediate outcome of the active stage be accurately predicted. Since the intradermal salt solution test has been demonstrated to be a means of predicting the onset and course of oedemas and the length of the disappearance time has been considered to have a probable relationship to the degree of certain types of intoxications, its applicability to diagnosis and prognosis in the late toxemias of pregnancy was tested.

The test was made in 47 normal pregnant women at term to ascertain the normal disappearance time during pregnancy, and in 46 women (including 17 eclamptics) with the late toxemias of pregnancy. These patients were in the Cook County Hospital on services of Doctors Hillis, Van Hoosen, Lewis and Lee.

TABLE I—DISAPPEARANCE TIME IN NORMAL PREGNANT WOMEN AT TERM AND IN PATIENTS WITH LATE TOXEMIAS OF PREGNANCY

Condition	Race	Disappearance Time ¹						Number of cases
		Forearm			Leg			
		Shortest time in minutes	Longest time in minutes	Average time in minutes	Shortest time in minutes	Longest time in minutes	Average time in minutes	
Normal pregnancy	White	62	101	82.6	38	91	61.5	20
	Black	56	150	110.6	45	138	81.8	27
Toxæmia of pregnancy without convulsions	White	14	67	34.3	13	64	56.6	8
	Black	6	80	37.2	3	64	27.2	21
Toxæmia of pregnancy with convulsions	White	10	52	27.3	0	55	26.3	6
	Black	2	47	19.5	0	40	16.5	14

¹In the pathological cases the figures represent the disappearance time during the active stage of the toxemia

TECHNIQUE

The technique of McClure and Aldrich was employed as follows: 0.2 cubic centimeters of an 0.8 per cent aqueous solution of sodium chloride was injected intracutaneously under aseptic conditions. A duplicate injection was made about 2 centimeters from the first, as the disappearance of the depression between the two wheals was an aid in determining the end point. The flexor surface of the forearm and the medial surface of the leg were the sites selected for the injections. The disappearance time was the time taken for the elevations or wheals to disappear as determined by palpation. The frequency of observations depended on the character and course of the case, thus, in the normal pregnant women one careful test was considered sufficient, while in the abnormal, tests were performed at intervals of several hours, days, or weeks. In the normal women a 5 to 10 minute variation in disappearance time was considered of no significance as the end point was not always well defined in this group, although definite in the toxemic women.

NORMAL PREGNANCIES

The normal group consisted of 20 white women and 27 negro women varying in ages from 15 to 36 years (72 per cent were 15 to 24 years old). Of these 26 were primiparæ and 21 multiparæ. The blood pressures were between 100-140 millimeters systolic and 60-100 millimeters diastolic, 75 per cent being 125 millimeters or under, systolic. The urine was normal in all cases.

The disappearance time for the forearm in white women varied between 62 and 101 minutes with an average of 82.6 minutes, falling below 71 minutes in but 2 cases, in the leg it varied between 38 and 93 minutes with an average of 61.5 minutes, falling below 51 minutes in 3 cases.

For the negro women the disappearance time was considerably longer, varying for the forearm between 56 and 150 minutes with an average of 110.6 minutes, and falling below 71 minutes in but 2 cases. In the leg the disappearance time ranged from 45 to 138 minutes with an average of 81.8 minutes, being below 51 minutes in 3 cases and above 120 minutes in 1. Inasmuch as palpable oedema was present in the lower extremities of almost all the pregnant women at term, due to pressure by the gravid uterus on the blood vessels the shortened time in the legs was indicative of only a local disturbance. This ability of the intradermal salt solution test to determine local disturbed water balance in the tissue was suggested by Cohen (4) as a means of determining the level of adequate circulation in circulatory disturbances associated with local vascular disease leading to gangrene and requiring surgical procedure. Parity influenced the disappearance time only in so far as multiple pregnancies favored the development of varicosities which increased the oedema in the legs to some degree.

PREGNANCIES WITH LATE TOXEMIAS

The 46 women with the late toxemias of pregnancy included 29 without convulsions

TABLE II--ECLAMPTICS¹

ANTEPARTUM

Name Age Race	Duration of pregnancy	Date of test	Diagnosis time in months		Edema palpable	Blood pressure	Urine	Brief clinical course
			Fore- arm	Leg				
ES 23 Negress	5th month	1925 7-2 1-15 7-7 1-3 3	47 4 67 55 50	30 50 66 54 No e	N n N n N n N n No e	160-95 178-100 18-90 144-95 138-85	Alb + + + + Casts Alb + + Few casts Alb trace No casts	Disturbed vision vomiting convulsions Treatment after 1st made Treatment repeated before test
EH 0 Negress	Term	5-5 5-6 5-21	5 7 30	7 6 48	Mild ed Marked None	150-20 106-115 135-0	Alb + + + + Casts Alb + + + + Casts Normal	Disturbed vision hiccups convulsions Treatment after 1st made Delivered by midwife Home on 10th day postpartum
AL 7 Negress	Term	6-14 6-5 6-24	13 26 26	0 65 65	Slight Slight None	154-22 124-95	Alb + + + + Casts Alb trace No casts	Convulsions Labor induced Spontaneous delivery Home on 10th day postpartum
FL 8 Negress	7th month	6-17 6-17 6-16 6-4	1 50 68 67	18 19 No e	Mild ed Mod ed None	170-100 146-100 10-74	Alb + h casts Normal	Convulsions Treatment after 1st made Condition improved Convulsions continued Labor induced Spontaneous delivery Home on 10th day postpartum
AG 14 White	6th month	19-4 5 hr lat 10-27 1-3	18 27 6 31	0 20 44	Slight Slight N n	0-30 40-100	Alb + + Casts Alb + Casts	Convulsions Treatment after 1st test Improved Home on 10th day postpartum
RB 15 Negress	7th month	19-5 5-8 5-0 3-30 3-31 4-4 4-8 4-4 4-0 4-30 5-3	16 8 33 30 34 00 67 64 60 68	5 9 5 35 43 N n N n N n N n N n N n	Mild ed Mild ed Moderate N n N n N n N n N n N n N n N n	1-13 10-136 108-18 175-16 185-0 1-13 08-32 185-128 30-8	Alb solid RBC casts Alb + + Casts Alb trace No casts	No treatment in previous pregnancy Hiccups Spots before eyes dark red convulsions Treatment after 1st made Labor induced Spontaneous delivery Feels better No complaints Home on 10th day postpartum

INTRAPARTUM

MB 15 Negress	Term	10-5 2-28 6 hr lat 9	47 0 46 47 45 50 65 78	40 1 45	Puff n sa el y lids No e N n N n N n N n N n	04-55 5-108 136-94 134-90 1-3-80 1-8 124-82 4-85	Alb + + + + RBC WBC casts Alb trace No casts Nrm	Pain in stomach hiccups omitted decreased urine output Convulsions Delivered by version and extraction after 1st made Eight convulsions Postpartum Treatment before 1st Improving Home on 15th day postpartum
LV 18 White	Term	1-17 2-28	35 66	35 64	N n None	160-90 156-98	Alb + + Casts	Convulsion and labor Delivered spontaneously Treatment by midwife Rapid delivery Home on 10th day postpartum
JH 75 Negress	Term	3-3 3-3 3-7 3-7 3-7 3-7	8 5 35 35 95 83 1-5	7 4	Mild ed Mild ed Mild ed N n N n N n N n	106-13 154-10 158-102 165-10 138-83 150-102 12-0	Alb + + + + No casts Nrm	Convulsions labor Delivered by midwife Uterine Fuerperi Home on 10th day postpartum
FA 2 Mfe n	7th month	1-3 — 3-5 — 3-0	13 15 17 6 70	9 5	Mod rate Slight N n No e N n N n	174-126 156-14 154-95 138-95 24-8 14-8	Alb + + Casts RBC WBC No m l	Delivered by midwife Delivered by midwife Delivered by midwife Delivered by midwife Delivered by midwife Delivered by midwife Home on 10th day postpartum

¹All patients in Table III were pregnant at the time of the study stated

TABLE II—Continued

POSTPARTUM

Name Age Race	Duration of pregnancy	Date of test	Disappearance time in minutes		Edema palpa- ble	Blood pressure	Time	Post clinical course
			Fore arm	leg				
B.M. 32 White primipara	Term	5-25 5-28	5"	3"	None	100-110	42	Labor 24 hours. Delivery spontaneous at 4 o'clock. Placenta delivered 10 minutes. Cord clamped. Contraction 15-20". Condition improved. Home on 17th day postpartum.
		5-23 5-25 5-27	52 6"	51 6.4	None None None	150-90 100-110 100-110		
E.S. 22 White	Term	5-4	12	2"	Marked	100-100	42	No special history. Delivery spontaneous. Contraction 15 minutes later. Ovaries and uterus normal. Improved. Good. No further clinical observations.
		5-14 later 5-5	33 30	32 45	Marked Moderate	100-100 100-100		
E.G. 18 Negro	Term	6-1	12	11	Slight	100-100	42	Labor 10 hours. Delivery spontaneous at 4 o'clock. Placenta 15 minutes later. Home on 1st day postpartum.
		6-13 6-15	15 20	14 5	None None	100-100 100-100		
M.W. 27 Negro	Term	1-4	20	12	Marked	100-100	42	Labor, placenta delivered 10 minutes later. Delivery spontaneous 1-4-25. Contraction 15 minutes later. Home on 1st day postpartum.
		1-5 1-6 1-7 1-9	15 21 43 4	14 41 43 44	Severe None None None	150-100 100-100 100-100 100-100		
C.A. 21 Negro	Term	1-14 1-15	12	6	Marked	100-100	42	Delivery 10 minutes spontaneous 1-1-25. Contraction 15 minutes later. Home on 1st day postpartum.
		1-10	0	4	None	100-100	Normal	
M.C. 14 White	Term	11-5 11-6 12-3	52 2 —	53 65 55	Severe None None	100-100 100-100 100-100	42	Delivery spontaneous 11-1-25. Contraction 15 minutes later. Home on 1st day postpartum.
W.D. 17 Negro	Term	11-6 11-6	13 4"	13	None None	100-100 100-100	Normal Normal	Delivery spontaneous 11-1-25. Contraction 15 minutes later. Home on 1st day postpartum.

and 17 with convulsions. In the former group, 8 were white women and 21 negro women, the ages varied from 18 to 42 years with 8 under 24 years and 5 over 35. There were 13 primiparae and 16 multiparae. Of these 8 were at term, 7 at the eighth month of pregnancy, 8 at the seventh month, 3 at the sixth month, 1 at the fifth month and 2 at the fourth month. The blood pressures varied between 116 and 260 systolic and 70 and 174 diastolic. The other findings in this group were albuminuria or jaundice or a combination of these. Palpable edema of the legs occurred in 37 per cent of the white women and 55 per cent of the negro women.

In the group with convulsions 6 patients were white and 11 black, 10 were 15 to 19 years of age, 6 were 20 to 24 years and 1 was 30 years of age. Sixteen were primiparae and

1 was a multipara, 12 were at term and 5 at eighth month of pregnancy. The blood pressures ranged from 148 to 206 systolic and from 90 to 130 diastolic. The urinalyses showed albumin varying in amount from a one plus to complete solidification and hyaline, granular, and cellular casts. The blood chemistry determinations in the eclamptics showed no deviation or only slight deviation from the normal except that in several cases there was a definite retention of uric acid. Only in patient A.B., with a late toxemia superimposed upon an old nephritis was there a retention of urea. Summarized figures of the disappearance times for the two pathological groups and, for comparison, the normal group are given in Table I. The lowest disappearance time in the forearm of patients of the three groups is shown in Chart I.

TABLE III—TOXÆMIAS OF PREGNANCY WITHOUT CONVULSIONS

Name Age Race	Duration of pregnancy	Date of test	Disappearance time in minutes		Edema palpable	Blood pressure	Urine	Brief clinical course
			Fore arm	Leg				
O N 23 Negress	Term	1925 5-8	24	8	N c	160-100	Normal	No complications. Sent in by prenatal clinic because of hypertension for observation
		3-9	22	10	N	145-90	Norm 1	Treatment after test made
		5-11	37	35	None	155-90	N mal	
		4-8	35	33	N e	154-105	Norm 1	C diet unchanged Labo and ced. Delivery spontaneous
		4-8	64	33	None	145-85	N renal	
		4-4	24	23	N e	160-114	Normal	
		4-8						
		4-0	57	30	N e	115-80		H me
		4-12	5	6	No e	135-90		
		4-6	35	66	None			
V L 18 White	8th month	4-1	24	23	M k d	228-16	Alb + + + + Ca ts R B C W B C Diacet c acid	Gradual loss of vision. Headaches spot before eyes. Ophthalmic examination. Diet held retic. Cervix dilated with Voorhees bags. Vision and delivery.
		4-4	15	9	M k d	100-90	Alb + + Few casts	D t gushes light from dark Objects visible H me o clease Vision improved
		4-13	35	34	Moderate	180-120		
		4-6	37	50	None	160-100		
		4-30	51	35	N e	80-12		
A S White para	Term	1924		24	M k d	160-150	Alb + + + + Casts acc to e	N to arm as a previous pregnancy. Told she had kidney trouble. Complained of post to then blood test. Blood pressure 115-80. Wassermann negative. Induction of labor.
		1-3	25	0	M k d	235-140	Alb + N casts	Del. ry spontaneous after test made Blinds sasm
		12-24	30	45	M d rate	0-8		
		12-3	61	63	None	196-133		
		10-3						
		1-6	4	40	None	160-115		
		1-13	66	65	No	64-13		
		1-13	64	73	N e	138-94		
A B 29 Negress v para	6th month	10-4	83	67	None	196-110	Norm 1	Only hypertension. Home on rest.
		11-7					Alb solid C ts	R t ined because of severe headache spots before eyes epulans C me Labo and ced. Delivery spontaneous before test made
		3-25	25	40	N e	230-60		
		3-6	23	57	N e	193-8		
		3-8	50	40	None	190-130		
		3-3	75	74	None	170-120	Alb + + + Few casts	F ll w ll Home Ref red to medical clinic
		4-6	63	67	No	183-123		
		4-8	7	70	N e	180-18		
		4-4	71	80	No	2-4-134		
V S Negress	8th month	10-5	40	5	Mark d	210-14	Alb + + + + Ca ts	Headaches during and during outp t
		1-4	37	6	Mark d	70-120	Alb + + + + Few casts	Laboratory s rasio s Delivery spontaneous
		1-5	4	30	Mild	491-3		
		1-6	65	40	Moderate	195-120		
		1-3	30	38	N	25-40		

The late toxæmias showed a definitely decreased disappearance time more marked in the eclamptic group with little difference between the forearm and the leg.

Tables II and III give the chief details of the course of the eclamptic cases and of 5 representative cases of the toxæmias without convulsions.

An analysis of the individual cases of the late toxæmias of pregnancy with and without convulsions, with a correlation of this disappearance time with the other findings, showed

1 The degree of shortening of the disappearance time corresponded to the severity of the toxæmia and a return to normal of the disappearance time occurred with the general clinical improvement following medical treatment or delivery.

2 There was no constant relationship between the disappearance time and hypertension, or albuminuria unless changes in these were associated with changes in the general condition of the patient. In the edematous regions, the shortening of the disappearance

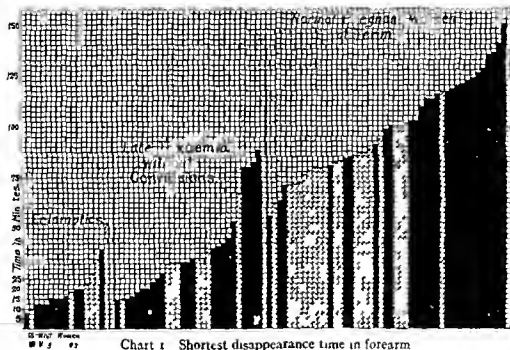


Chart 1 Shortest disappearance time in forearm

time was in general most marked when the edema was greatest

Two eclamptic patients (L M and K S) who had recovered from eclampsia with a coincident return of the disappearance time almost to normal, died subsequently of confluent bronchopneumonia (autopsy) without an accompanying reduction in the disappearance time. Thus the test predicted a subsiding of the toxæmia although the patients died because of complications

The pathological findings in the urine gradually disappeared with clinical recovery, except in those patients who had a nephritis as a result of their toxæmia or of some former etiological factor

CONCLUSIONS AND COMMENT

1 The disappearance time of intradermally injected salt solution in normal pregnant women is longer in the negro than in the white. This racial difference can possibly be explained by the thicker skin in the negro (Unna, 8)

2 The women with the toxæmias of pregnancy show definitely decreased disappearance time, more marked in those with convulsions. The degree of decrease in the disappearance time varies directly with the degree of severity of the toxæmia, increasing with the general clinical improvement

3 The same factor, or group of factors, that produces the edema, hypertension, and albuminuria in the late toxæmias of pregnancy, apparently produces the condition in the tissues which give a decreased disappearance time. Hence the intradermal salt solution test may prove a valuable aid in diagnosis and prognosis of these conditions

The use of the test routinely during the later months of pregnancy may prove of value in determining the oncoming of a toxæmia earlier than by other methods now available

REFERENCES

- ALDRICH C A A study of the clinical course of generalized edema J Am M Ass, 1925, lxxiv
- ALDRICH C A and McCLURE W B The intradermal salt solution test II Its prognostic value in 'nephritis with generalized edema J Am M Ass 1924 lxxiii, 1425
- BAKER, W J Intradermal salt solution test in scarlet fever and diphtheria patients J Am M Ass 1924, lxxiii 1566
- COHEN M B The intracutaneous salt solution test etc J Am M Ass, 1925 lxxiv, 1561
- HARRISON J Intradermal salt solution test in lobar pneumonia in children J Am M Ass lxxiv, 1258
- McCLURE, W B, and ALDRICH C A Time required for disappearance of intradermally injected salt solution J Am M Ass 1923 lxxii 293
- PLASS E D and BOGERT, L J Plasma protein variations in normal and toxemic pregnancies Bull Johns Hopkins Hosp 1924 xxv 361
- UNNA, P G Ziemssen's Handbook of Skin Diseases
- ZANGEMEISTER W Der Hydrops Gravidarum usw, Ztschr f Geburtsh u Gynaek, 1919 lxxii, 491

A SHORT DISCOURSE ON SURGERY OF THE GALL BLADDER¹

BY WILLIAM J. MAYO, M.D., F.A.C.S., ROCHESTER, MINNESOTA

IN 1909 Abel and Rowntree discovered that the dye phenolsulphonphthalein, was eliminated through the kidneys without chemical change and without affecting the tissues of the body, at once demonstrating the filtering function of the kidneys and proving that the molecule of the dye is approximately the size of the molecule of urea which is one of the smallest of the organic molecules. From these deductions Rowntree and Geraghty perfected the phenolsulphonphthalein test which has been of enormous value in estimating the functional activity of the kidneys. Rowntree later found that the specific excretion of the dye phenol tetrachlorphthalein through the bile made possible a dye test of hepatic function. Rosenthal, by ascertaining the length of time required to eliminate phenoltetrachlorphthalein, has been able to give permanent value to Rowntree's original discovery by developing a method which gives perhaps the best test for hepatic function which we have.

Graham and Cole have utilized Rowntree's discovery to develop cholecystography working first with phenoltetrachlorphthalein, which in the gall bladder gave a faint shadow under the X-ray later with the corresponding iodine and finally with the bromine substitution product of phenoltetrachlorphthalein. Their experiments led the way to the discovery of the physical condition of the gall bladder by the shadowgraph, a diagnostic aid of tremendous importance. Cholecystography is valuable from the negative as well as from the positive side. When no shadow of the gall bladder is seen on cholecystographic examination we know that there must be occlusion of the cystic duct, probably as the result of contraction on gall stones or strictures which acted as mechanical blocks. When the test is positive, the shape, size, and general position of the gall bladder are shown and stones which otherwise might be overlooked may sometimes be recognized. My colleagues, Carman and his associates find that

the test is of value in more than 85 per cent of cases.

There is a serious type of cholecystitis however which at times gives rise to active symptoms, in which the bile ordinarily enters and leaves the gall bladder without mechanical blockage. The condition is most common in connection with "cholesterosis" or 'strawberry' cholecystitis and papillomatosis of the gall bladder. Besides this type of disease there may be gall stones so small that they cannot be detected by palpation of the unopened gall bladder at surgical operation and which do not prevent bile from entering and leaving the gall bladder. It is true that in all of these cases when the condition becomes acute blockage of the cystic duct occurs as the result of swelling and oedema and no bile enters or leaves the gall bladder for the time being. Unfortunately patients are usually so ill under these circumstances that cholecystographic examination cannot be made.

In a great many cases in which the diagnosis of cholecystitis has been based on clinical phenomena alone I have removed a gall bladder which has shown no physical evidence of disease even when exposed at operation, but the interior of which on pathological examination has disclosed conditions which gave rise at times to colic and all the acute manifestations of gall stone disease as well as chronic digestive disturbance. It therefore behooves us to be extremely careful not to allow clinical findings to be overborne because of a normal appearing shadow of the gall bladder.

In 4,908 cases in which cholecystectomy was performed in the Clinic between January, 1912 and July, 1918, MacCarty and his associates in the laboratories of surgical pathology found that the gall bladder had been removed in 17 without sufficient evidence to justify the operation. The history in these cases however, was not clear and we had been unable to check our clinical

¹ Read before the Chicago Medical Society, Chicago, January 20, 1916.

findings by seeing the patients during acute manifestations. In other words, we had depended too greatly on the history. Rosenow has shown that although pathogenic bacteria, which can be cultured, may exist in the submucosa of the gall bladder, the bile may be sterile, and probably in some of these 17 cases the gall bladder was removed during a stage of temporary quiescence.

In the earlier time, in doubtful cases we opened and examined the interior of suspected gall bladders, removed a piece of the mucosa for microscopic examination, and, guided by the findings, closed the gall bladder or performed cholecystostomy or cholecystectomy as seemed wise. Some of the patients whose gall bladders were then apparently shown to be normal came back later, with continuing symptoms, for operation. We then discovered that "cholesterosis" or papilloma might exist deep in the pelvis of the gall bladder rather than in the fundus, and that the abnormality could not be detected by the sense of touch, of course, unless the gall bladder was destructively split from top to bottom, the condition could not be seen. It seems wise, therefore, in some of the doubtful cases, to remove the gall bladder when the clinical findings are positive, even if the cholecystographic findings, palpation, and inspection of the exterior of the gall bladder, are negative.

The old controversy, cholecystostomy versus cholecystectomy, like Banquo's ghost, will not down. In the Clinic we perform cholecystectomy in more than 90 per cent of cases of gall bladder disease as against cholecystostomy in less than 10 per cent. In average cases, if cholecystectomy can be performed as safely as cholecystostomy, it brings about permanent cure in a much higher percentage. Patients from whom I removed stones by cholecystostomy 15, 20, or even more than 25 years ago, after many years of good health, occasionally return with a new crop of stones, or other definite disease of the biliary system. The stones were not overlooked, but were of later formation, and of different composition, as demonstrated by comparison with those removed at the former operation.

It should be remembered that after cholecystostomy the gall bladder becomes fixed in adhesions, and the mere absence of symptoms is no indication that it is functioning. This is an all too common assumption. Many times I have operated for other purposes on patients for whom I had previously performed cholecystostomy, and on examining the gall bladder have found it buried in a mat of adhesions and obviously functionless. A comparable state may occur following operations on the kidney. A diseased kidney may be saved, and, because it does not give rise to further trouble, it is supposed to be functioning, when urological examination would show it to be functionless. Of the patients for whom we perform cholecystostomy rather than cholecystectomy, we expect a certain number will later require removal of the gall bladder.

One hears a great deal about dilatation of the common duct following cholecystectomy in experimental animals. I have not been greatly impressed by these findings. There is a difference between a healthy dog with a normal bile tract and a sick human being with a diseased biliary apparatus. When the gall bladder is contracted down on stones, and cholecystographic examination shows that no bile enters the gall bladder, a fact proved later at operation, we might say, so far as function is concerned, that there has been a pathological cholecystectomy, yet careful dissection of the common duct in these cases does not often disclose marked dilatation or any of the untoward findings which would appear to be peculiar to experimental animals.

In cases of acute cholecystitis, when the gall bladder is very large, distended, and oedematous, with localized peritonitis from complete blockage at the cystic duct, I have had the best results from direct dissection of the cystic duct at the common duct, early closure of the cystic duct with a pair of forceps, and removal of the entire gall bladder, which is easily enucleated with its contained stones and septic material. In acute cases of this kind it sometimes happens that the gall bladder is reduced in size by even gentle manipulation before one can block the cystic duct effectually at the com-

mon duct which leads to the suspicion that some septic material has been allowed to pass into the common duct. In this event I leave the forceps on the stump of the duct after the removal of the gall bladder, or tie the stump at the common duct with a granny knot of catgut leaving the ends of the ligature long hanging outside the body so that if there should be symptoms of retention in the common duct and failure of good drainage of bile through the normal channel the threads can be pulled off or the forceps can be unclamped allowing the stump of the cystic duct to open and permit free discharge of bile to the surface. The instantaneous relief that comes in the occasional case on the second or third day through this maneuver is most gratifying.

When foul infection by bacillus coli is found at operation especially in association with perforation of the gall bladder the condition of the appendix must be determined since simultaneous perforation of the appendix and the gall bladder is not infrequent, and if overlooked may result disastrously. The history in such a case is usually that of frequent attacks of gall stone colic before the attack which resulted in the acute perforation a result probably of a primary acute infection in the appendix secondarily activating a susceptible gall bladder. In cases of this type when the condition is very acute with spreading peritonitis cholecystostomy with free drainage may be a better and safer procedure than cholecystectomy.

Perforation of the gall bladder into the transverse colon or the duodenum is not infrequent and it is probable that most of the larger gall stones escape through perforations rather than through the common duct.

When cholecystostomy is performed on account of small stones it is sometimes difficult to be sure that all the stones have been removed. In these cases I have found a maneuver which I learned from the late Dr. Ochsner very valuable that is plugging the gall bladder with iodoform gauze thus leaving the gall bladder widely open so that as the gauze comes out a better opportunity is afforded for overlooked stones buried in mucous pockets to escape.

Malignant disease of a gall bladder containing gall stones is not uncommon, but the symptoms are seldom acute at the time the patient comes to operation. The usual history is that after the patient has suffered from attacks of colic for some years the disease reaches a quiescent or chronic stage to be followed months or years later by tumor and eventually by obstructive jaundice. The time element is equally a factor in cases of carcinoma or ulcer of the stomach. There is usually a period of freedom from symptoms of ulcer before carcinoma begins.

In cases of carcinoma of the gall bladder, our permanent cures have followed cholecystectomy performed because the gall bladder was diseased not because the disease was known to be carcinoma, early carcinoma being found on examination of the removed gall bladder in the laboratory. In all the cases in which carcinoma could be readily diagnosed before operation either the condition proved to be inoperable or operation was followed by recurrence of the disease within 18 months.

When there are stones to be removed from the common duct in the presence of jaundice, it is not wise to remove the gall bladder at the same time if removal can be avoided.

The blood pressure in the portal circulation is approximately 20 millimeters of mercury and in the general circulation a counter pressure of 100 millimeters. Walters reviewing the statistics of surgery of the gall bladder and biliary tract in the Clinic in 1921 found that the death rate from cholecystectomy with removal of stones from the common duct in the case of the jaundiced patient was considerably greater than that from cholecystostomy and choledochotomy, and that in 50 per cent of the cases of death following choledochotomy and cholecystectomy performed in the presence of jaundice, necropsy disclosed more than 300 cubic centimeters of blood in the abdomen. These facts led to the institution of methods of prevention (the intravenous use of calcium chloride and other means when necessary) of postoperative hemorrhage in the jaundiced patient which have lowered the incidence of postoperative bleeding in these cases to less than 1 per cent, provided the biliary obstruc-

ton has been relieved adequately at operation. The liver in cases of jaundice is friable and congested and will bleed very freely even from a needle puncture. Finally, in any case, when I believe the risk of cholecystectomy will be greater than that of cholecystostomy, I do not insist on the removal of the gall bladder at a primary operation. Again, if infection has extended beyond the gall bladder and involves the common and hepatic ducts, the liver or pancreas, cholecystostomy is the better procedure.

The green or white bile-distended gall bladder without stones which is found associated with obstructions in the head of the pancreas (the result of either carcinoma of the pancreas, pancreatitis, or the small hard malignant tumors of the common duct which may feel almost like a stone) are worthy of mention. Courvoisier pointed out many years ago that the gall bladder is contracted in 84 per cent of cases of stone in the common duct, because the gall bladder in forcing the stone through the cystic duct into the common duct, develops so much connective tissue in its walls that it is not able to dilate again. In the doubtful case of jaundice without gall stones of this type, it is best to perform cholecystogastrostomy or cholecystoduodenostomy. I have had cases in which I performed cholecystogastrostomy for complete biliary obstruction of what proved to be benign pancreatic origin in which all the bile passed into the stomach for years without causing the patient discomfort.

Accidents in performing cholecystectomy are most often due to insufficient care in locating and isolating the cystic duct and the cystic artery. It should not be forgotten that the cystic duct has its origin to the liver side of the pelvis of the gall bladder and that the cystic artery usually has its position to the inner side of the duct. Adhesions between the pelvis of the gall bladder and the common duct may drag the latter upward so that it may be mistaken for the cystic duct, and in the course of operation a piece may be removed accidentally from the common duct. Again, if the cystic artery escapes and retracts deeply, in the attempts of the operator to catch it quickly with rat tooth forceps,

the latter may bite a piece out of the hepatic duct, leaving permanent biliary obstruction, the repair of which is one of the most difficult problems in surgery.

The incision we use is based on that of Bevan, beginning as high as possible between the ensiform cartilage and the costal margin and passing down about 2 centimeters to the right of the median line, and of sufficient length to enable easy manipulation and also to permit the examination of the appendix and its removal if necessary. The reason this incision is advisable is that the common duct in its preduodenal portion is nearly transverse, but on passing under the duodenum into or behind the head of the pancreas it descends almost parallel to the long axis of the body close to the median line of the body. In the male the distended gall bladder usually extends downward and to the right toward the anterior superior spine of the ilium, in the female, it more often extends toward the umbilicus and to the median line.

I have found very helpful the suggestion made by L. L. McArthur some years ago to leave the peritoneum and the posterior aponeurosis of the rectus muscle uncut in the lower one fourth of the incision. These tissues can be retracted readily, and protect the lower part of the wound against hernia. Whereas hernia frequently used to follow operation on the gall bladder, I have seen none in the lower part of the incision since I have followed this practice. The liver usually comes down under the upper part of the incision, so that only a small space is unprotected.

In approximately 100 consecutive cases in which I performed cholecystectomy I drained only when there was an acute infection, but in one or two cases in which I was in doubt whether drainage was necessary or not but did drain, bile subsequently escaped from the wound. A little drain is a comfort to the surgeon and sometimes a life buoy for the patient. In fleshy patients if drainage is used, it is wise to bring the drains out through a stab wound well to the right so that the main incision can be completely closed. The troublesome hernia which sometimes follows the institution of free drainage through the incision can thus be avoided.

CARCINOMA OF THE RECTUM AND SIGMOID

ANALYSIS OF ONE HUNDRED AND TWENTY ONE CASES
RESULTS OF TREATMENT BY RADIATION¹

By A. W. JACOBS, M.D., NEW YORK CITY

Adj. t. Phy. can. C. Div. n. d. O. p. r. t. m. t. of Rad. th. gy. Montefiore Hospital Rad. th. p. t. to Leba. n. Hospital

CARCINOMA OF RECTUM

THE total number of cases of carcinoma of the rectum admitted to the Montefiore Hospital for the period of 10 years from January 1914 to December 31, 1924, was 91. In 13 cases (14 per cent) there was a history of cancer in the family. The condition occurred in males in 55 cases (61 per cent). The youngest patient was a female of 19 years; the oldest was 80 years of age.

Age Period	Cases	Age Period	Cases
19 to 30	7	51 to 60	26
31 to 40	12	61 to 70	24
41 to 50	15	71 to 80	7

In about 55 per cent of the cases the condition occurred between the ages of 50 and 70.

Mode of onset. Blood was present in the stool in varying amounts at the onset of symptoms in 56 cases (about 60 per cent) with frank hemorrhage from the rectum in 5. Constipation was present in 35 cases (about 40 per cent). In 10 the onset was marked by abdominal cramps and constipation, in 14 by diarrhoea, by obstipation alternating with attacks of diarrhoea in 2, by dyschezia in 22, by tenesmus in 20. Constipation was present at some time or other during the course of the disease in 52 cases (about 60 per cent). Pain varying in character from a dull sense of pressure or discomfort to burning sticking, or lancinating pain was present in the region of the rectum in 21 cases and in the lumbo-sacral region in 10. Pruritus ani was present in 2 cases, pruritus vulvæ in 1 case, dysuria in 3 cases. In 1, the onset was marked by generalized abdominal pains and diarrhoea followed by numbness in the toes and sticking pains in the lower left limb; in another by postpartum fever, dyschezia, menorrhagia and metrorrhagia.

There was one patient with a history of an appendicostomy for chronic colitis of 3 years' duration followed by a colostomy 1 year later,

at which time the rectal mucosa was found to be thickened and studded with polypi and ulcerations of all sizes.

Ischio-rectal abscess and fistula occurred in 5 cases. Hemorrhoids were mentioned as being present and treated in 25 (about 28 per cent).

In 36 cases (about 40 per cent) there was progressive weakness and loss in weight. Rectal examination revealed palpable evidence of a mass in 65 cases (about 70 per cent) with ulceration in some. Metastases occurred in the inguinal glands in 27 cases, in the liver in 10, in the female pelvic organs in 9, in the retroperitoneal and pelvic glands in 6, in the lungs in 4, in the perineum in 3, in the femur in 2, and in 1 case in each of the following: kidney, prostate, omentum, cerebrum, breast, sacrum and ilium, vaginal wall and subcutaneous tissue.

The type of tumor was adenocarcinoma in 17, colloid carcinoma in 5.

Death was from terminal bronchopneumonia or infection with asthenia.

Surgical procedures were instituted in 60 cases (about 65 per cent). The Kraske operation or a modification of it was done in 20 cases, a colostomy in 40.

Local recurrences of the growth after surgical procedures have occurred as early as 6 weeks after operation and as late as 2 years, the average being 6 months. The total duration of life after the initial surgical treatment has varied from 1 week to 32 months with an average duration of 1 year, however, there were 2 patients alive 4 and 8 years, respectively, after operation. This is unusual. Excluding the cases with immediate operative mortality, the entire duration of the condition from onset until death when a surgical procedure in some form or other was done varied from 2 1/2 months to 4 years, the average being 2 years. The duration of life from onset until death in

¹From the Department of Surgery, C. N. Davis, Montefiore Hospital. Read before the meeting of a alumni of Leba. n. Hosp. t. New York October 13, 1925.

the cases in which no surgical treatment was given varied from 7 to 34 months, the average being also about 2 years

Autopsy findings In 15 cases there was a local recurrence, with extension to the perirectal tissues, uterus pelvic tissues, and regional glands, in 12 of the 15 cases. Metastases were present in the lungs in 8 cases, in the liver in 6, in the adrenal in 6, in the thyroid, meninges, pancreas and kidney in 3 each, in the pleura in 2, and in 1 case in each of the following spleen, cerebrum, cerebellum, calvarium, heart, ribs, sternum, lumbar vertebrae, and sacrum

CARCINOMA OF THE SIGMOID

The total number of cases of carcinoma of the sigmoid for the period of 10 years was 30. There was a family history of cancer in 2.

The youngest occurred in a man of 28 and the oldest in a man of 72

Age Period	Cases	Age Period	Cases
23 to 40	7	51 to 60	12
41 to 50	7	61 to 72	4

In about 58 per cent of the cases the ages were between 41 and 60

Mode of onset In 10 of the cases (33 1/3 per cent) the onset was marked by abdominal cramps, vomiting, and constipation, with evidence of a mass on physical examination, in 4 cases, the onset was marked by a sudden attack of abdominal pain and by a mass in the abdomen, with vomiting, constipation, and abdominal distention in 1, and bloody diarrhoea in another, in 4 cases, by diarrhoea and bright red blood in the stools, and in 2 by constipation and bright red blood in the stool, in 3 cases, by progressive constipation and abdominal pain followed by obstipation with palpable mass, in 2, by abdominal cramps and diarrhoea alternating with constipation, in 1 by persistent painless diarrhoea, in another, by intestinal obstruction. There was a history in 1 case of operation for uterine tumor 20 years previously, followed by 9 operations in the ensuing 3 years for faecal fistulae. The onset was marked by pain. Physical examination showed a nodular mass in the abdomen. At operation, the diagnosis was faecal fistula with carcinomatous degeneration and chronic intestinal obstruction

Physical examination (abdominal and rectal) showed the presence of a mass in 16 (50 per cent) of the cases. Constipation was present in 20, diarrhoea in 6, abdominal cramps in 16, blood in the stools in 8 (1 with hæmorrhages), ascites in 3. Metastases occurred in the liver in 5, in the pelvis in 4, in the peritoneum in 3, in the inguinal glands in 2, in the omentum and general abdomen in 2, and in the lungs, skull (right temporal area), bladder, vagina, and broad ligaments in 1 each.

The pathological report was adenocarcinoma in 10 cases, and colloid scirrhus, and necrotic tumor in 1 each.

The presence of tumor cells in the ascitic fluid was reported in 2 cases.

Surgical treatment Resection or colostomy was done in 20 cases, in most of the cases on account of the obstruction present. The entire duration of life from onset of symptoms until death when operation was performed varied from 5 to 39 months, the average being 15 months. The postoperative duration of life was from 3 to 12 months, with an average of 8 months. One patient without any surgical treatment was alive for 18 months and another for 24 months, the average being 18 months.

Autopsy findings were reported on 7 cases as follows: 2 cases of carcinoma of the sigmoid with metastases in the peritoneum, 1 carcinoma of the sigmoid with extension to the retroperitoneal tissues, 1 with extension to the prostate, 1 with extension into adjoining pelvic tissues and metastases in regional lymph glands and liver, 1 with extension to pelvic fascia and metastases in regional and distant lymph glands, liver, lungs, peritoneum and sigmoidorectal fistula, and 1 colloid carcinoma with extensions to skin, peritoneum, bladder, omentum, and adjacent tissues, metastases in mesenteric glands, kidney, adrenals, liver, lungs, and mediastinal glands.

Treatment by radiation Of the entire series of cases of carcinoma of the rectum, 26 were treated by radium or deep roentgen therapy either alone or in combination, with temporary improvement or palliation of symptoms in 9 of them. The following case reports are abstracts from some of the cases treated by radiation.

CASE 1 H M single, age 62, was admitted to Montefiore Hospital December 24 1922 with chief complaints of bleeding and protruding masses from the rectum painful defecation and constipation. The family past medical and personal histories were negative except for the presence of hemorrhoids and hemorrhages from the rectum for which he had been operated upon 24 years ago. The present history dates back about 2 months during which time the patient has been having bleeding from the rectum in varying quantities a sense of fullness in the rectum constipation and some difficulty in urination. About 2 weeks before admission the patient was under observation in another hospital in the city where the record of rectal examination showed the presence of an ulcer with indurated edges and a growth on the posterior wall of the rectum. Repeated blood Wassermann reactions were negative. The biopsy report showed chronic inflammation and thickening. The case was referred for admission to Montefiore Hospital.

Rectal examination showed at 3 centimeters from the anus a fine very hard ring like structure. The left anterior segment was a little thicker than the rest and painful. At the right posterior quadrant of that ring was attached a soft round swelling about the size of a walnut. On the left lateral wall above the ring were a few hard nodules characteristic of malignancy. Biopsy was done and the pathological report was adenocarcinoma with secondary chronic infection. Radiation therapy was instituted beginning with insertion of bare tubes of radium emanation as the initial treatment followed by rectal applications of radium emanation at about weekly intervals. The dosage on the average was 200 to 250 millicurie hours with high voltage roentgen therapy to the pelvis anteriorly and posteriorly. Rectal examination April 11 1923 showed no evidence of induration but the presence of a few soft polyp like formations in the area of the old ring formation. Examination of the patient on September 10 1925 showed him to be in good general condition with no evidence of any neoplasm in the rectum 2 years and 8 months having elapsed since his admission to the hospital.

CASE 2 P S male age 40 was admitted to the hospital with a history of onset 4 years previously with bleeding from the rectum and general weakness. Rectal examination showed a cauliflower mass also hard palpable inguinal glands. This patient had been treated in the Memorial Hospital by colostomy and radium therapy in the form of bare tubes and subsequently at our hospital. The total duration from onset until death was 4 years.

CASE 3 L L male age 55 was admitted September 21 1920 with a history of onset 18 months previously with rectal pain and discharge constipation delay in initiating urinary stream and loss in weight (20 pounds since onset). Rectal examination showed the presence of an annular tumor mass beginning 3 centimeters from the anus and extending 3 centimeters. It eroded and invaded mainly the an-

terior and lateral walls of the rectum, the posterior wall being little involved. The tumor was extremely hard and narrow as a result probably of connective tissue scarring. He had been previously treated at Memorial Hospital by repeated insertions of bare tubes of radium emanation with an average of 2 000 millicurie hours at each time. This treatment was continued in our hospital as indications arose. The patient finally died from bronchopneumonia February 24 1923 the total duration of the condition until death being about 3½ years without operation except for 7 implantations of bare tubes.

CASE 4 I F male age 60 admitted September 12 1924 with history of onset 3 years previously marked by constipation and pain in the lower spine. The present complaints were bleeding from the rectum constipation and loss in weight and strength of 4 months duration. Rectal examination showed the presence of a large cauliflower mass. The treatment consisted of colostomy insertion of bare tubes of radium (26 total 8.5 millicurie) emanation and deep roentgen therapy to pelvis. The condition is apparently controlled and the patient is still under observation in our clinic now about 1 year.

COMMENT

There are no subjective symptoms characteristic of carcinoma of the rectum. Blood in the stools though present in this series in about 60 per cent of the cases is usually a late manifestation. Constipation of various degrees was present in about 40 per cent of the cases and usually was present before the active symptoms of cancer appeared. Constipation does not become markedly evident until the growth has encroached upon the calibre of the gut to such an extent as to produce stricture. Rectal examination revealed the presence of a mass in over 70 per cent of the cases. Periodical examination of the rectum in constipated patients would be an aid to early diagnosis. Flatulence and indigestion associated with stool irregularity and blood in the stool, demand careful local examination as the only means of diagnosis. When a person past the age of 40 gives a history of sudden onset of hemorrhoids or when anyone notices the presence of blood in the stool and a tendency to constipation a physician should be consulted without delay for a careful examination of the lower intestinal tract to rule out the possibility of an early carcinoma. In addition, gastro intestinal roentgen examination, proctoscopy, sigmoidoscopy, and biopsy, are measures to be used as an aid in diagnosis.

In this series of cases, the time between the onset of symptoms and consultation of a physician for treatment has varied from 1 month to 1 year. In 2 cases the interval was 18 and 24 months, respectively. However, the average time interval was one month in about 60 per cent of the cases.

Surgical statistics have shown that so far as mortality or recurrence is concerned, 30 to 40 years of age is the most unfavorable period for operation, and that while the very old are more liable to die from the operation than the young, the chance of permanent recovery is better among them.

CARCINOMA OF THE SIGMOID

In a group of 7 cases of carcinoma of the sigmoid in which surgery was performed (resection or colostomy) the results were as follows:

Duration of Symptoms	Type of Surgery	Postoperative Duration	Total Duration from Onset Until Death
4 months	Resection	12 months	16 months
6 months	Resection	12 months	18 months
14 months	Resection	3 months	17 months
26 months	Resection	10 months	36 months
6 months	Colostomy	3 months	9 months
6 months	Colostomy	7 months	13 months
7 months	Colostomy	4 months	11 months

In this group the longest time from onset of symptoms until death was 3 years. This case was treated by resection.

In the group of 20 cases of carcinoma of the rectum which were treated by radical surgery (Kraske operation or modification of it) the results were as follows:

Number of Cases	Postoperative Duration	Number of Cases	Postoperative Duration
1	1 month	1	4½ years
3	8 months	1	8 years
2	12 months	1	3 years (still living)
6	2 years	1	4 years (still living)
4	3 years		

Operation was performed in these cases within from 2 to 17 months after the onset of symptoms, the average being 8 months, with the best results in those in which operation was done early.

In a group of 22 cases in which colostomy was done at varying times after onset, from 2

to 22 months, average 7 months, results were as follows:

Number of Cases	Postoperative Duration	Number of Cases	Postoperative Duration
3	3 months	3	2 years
4	6 months	2	4 years (still living)
4	9 months	2	18 months (still living)
4	1 year		Radium therapy)

Of the entire series of cases, there was only 1 case which could be considered a cure, and that was in the patient who lived for 8 years after radical operation.

It is evident from the comparative study of the cases treated by radical surgery and those by colostomy, that the longest postoperative duration of life was obtained when consultation and diagnosis was made early and followed by radical surgery.

CONCLUSIONS

The majority of cases of carcinoma of the rectum are recognized when it is too late to accomplish much by radical surgery. To give a good surgical result, the diagnosis must be made early. Surgical statistics in the more advanced cases are not encouraging. It is in those cases that the proper combination of surgery and radiotherapy can accomplish something toward the alleviation of symptoms and the control of the growth of the neoplasm.

Radium, when properly applied will bring about a definite inhibitory and destructive effect in the majority of rectal neoplasms. There is sufficient evidence in the abstracts of the cases cited, and cases in the literature, to prove that radium is a valuable adjunct to surgical procedures now in use. In selected cases radiation should be used before and after operation.

Deep roentgen therapy should also be given in the pelvis with the hope first, of destroying or decreasing the amount of lymphatic tissue, and thus decreasing the opportunity for metastasis, and second, of destroying or inhibiting the growth of metastatic nodules.

I desire to express my indebtedness to Dr. Isaac Levin, formerly chief of the Cancer Division, Montefiore Hospital for his valuable suggestions.

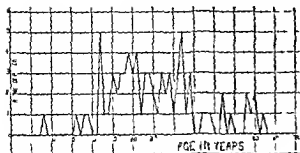


Chart 7 Age in years

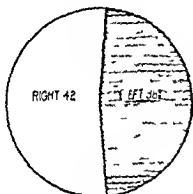


Chart 8 Side affected

cident occlusion of the lumen of the ureter. As a matter of fact Hunner rarely performs pelvic lavage for pyelitis but instead dilates the ureter and establishes good drainage which seems to clear up the pyelitis better than antiseptics.

Among the acute infections suffered by these patients (see Chart 3) influenza takes first place with 67.5 per cent, scarlet fever comes next with 20 per cent, diphtheria third with 15 per cent, pneumonia fourth with 12.5 per cent, and otitis media and puerperalism with a few cases each. This shows the part played by the streptococcus as all these infections are of that group.

SEX

In our series of strictures (see Chart 7) 45 occurred in males and 31 in females. This rather upsets the opinion that all of them occur in females. In checking up the sex of our patients, however, we found that we were treating three men to one woman. According to our figures, the ureteral stricture is twice as common in women as in men.

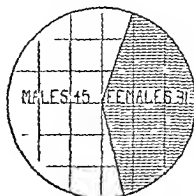


Chart 9 Sex incidence

AGE

The age incidences are well illustrated in Chart 7a, the youngest being 2 years and the oldest being 62. The greatest number of strictures occurred between the ages of 21 and 45.

POSITION

These strictures were almost equally divided between the right and left sides (Chart 8).

We found that 88 per cent of the strictures were single, although the figures of other observers show more of the multiple (Chart 9).

LOCATION

The location of strictures we found to be as follows (Chart 10): 51.8 per cent were in the lower third, 30.8 per cent in the middle third, and 17.4 per cent in the upper third of the ureter. This chart demonstrates that the lower third of the ureter claims over 50 per cent of all strictures.

SYMPTOMATOLOGY

These patients came to us with a great variety of complaints. They included patients who were suffering with acute renal colic resembling the colic of calculus of the ureter, and those who were often diagnosed as neurasthenics. Some of these patients had several well described symptoms, such as renal colic, dull pain in the abdomen, and backache. The symptoms occurred in this order (Chart 11): ureteral and renal colic, 54 per cent of the cases, in many of whom the diagnosis of calculus was made on account of the extreme colic like pain and its location in the kidney.

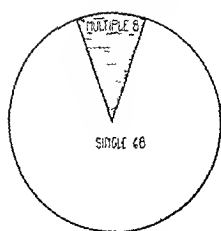


Chart 9 Number of stricture

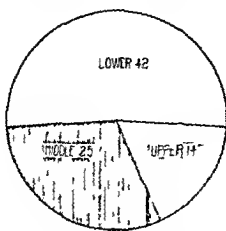


Chart 10 Location of stricture

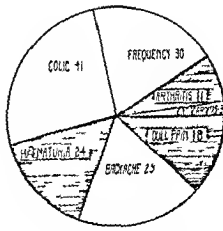


Chart 11 Symptomatology

region or along the course of the ureter frequency of urination 39 per cent probably due to an irritation of the ureter and bladder brought about by the sympathetic plus backache, 38 per cent of a dull character and invariably in the region of the kidney not always clearly explainable and sometimes due to ureteral obstruction which was relieved as soon as the catheter passed the point of obstruction emptying the pelvis, hematuria 30 per cent, probably due to forcible peristaltic contractions of the ureter against an edematous mucous membrane, dull abdominal pain, anterior, 29 per cent due to inflammation or to overdistention of the ureter, arthritis 14 per cent, simply another manifestation of the infection present, and endocarditis 4 per cent this lesion presenting the same relation to the condition as arthritis

TIME INCIDENCE

In working out the time incidence of these strictures we found that they averaged 3 years and 6 months from the onset of the pain to the discovery of the stricture. This was due to a misinterpretation of symptoms and a delay in making a renal study. For example

CASE 11613 C B B male 48 years of age complained of a number of attacks of right sided pain starting in the region of the right kidney and radiating into the groin. He has had several attacks lately with frequency of urination and hematuria. He had never passed a calculus but thought one was present. In the Philippine Islands he suffered with typhoid malaria and dysentery. He had an appendectomy, tonsillectomy and recently his frontal sinuses were drained. A renal study demonstrated a stricture in the upper third of the ureter (Fig 1). He

was entirely relieved by three dilations after suffering for many years.

The following patient (Case 10915) had many diagnoses and was considered a neurasthenic. She was a young woman 23 years of age a school teacher. Her chief complaint was pain in the left abdomen for 7 years this pain was aggravated by any form of exercise it was colic like in character and radiated to the left kidney. With this pain she had frequency of urination. The acute pain lasted from 2 to 5 hours and she was unable to work for several days. These attacks were accompanied by vertigo and syncope. A renal study demonstrated a stricture of the left ureter in its lower third. This was gradually dilated to No. 1, French. She had some severe reactions from these dilations as colic and a nervous upset for several days. The attacks have grown further apart until at present she is completely relieved of her former symptoms. This patient is a remarkable example of relief after severe suffering (Fig 2).

CASE 7726 a female 27 years of age, a stenographer by occupation and of a nervous irritable disposition complained that for 7 years she had been a semi invalid because of a severe pain in the lower abdomen. At first it was a dull ache, then colic like radiating downward. There was no nausea or vomiting and no food distress. She never had any fever that she knew of. This patient was first treated for appendicitis then for cholecystitis, for disease of the ovaries and then for disease of the kidneys. Badly infected tonsils were found and removed. A renal study revealed a bilateral stricture, one on the right side 15 centimeters and one on the left side 21 centimeters from the respective orifices. After several dilations this patient was entirely relieved of her symptoms.

We quote this case as being typical of ureteral stricture symptoms and the difficulty experienced in locating the lesion.

There are other findings which we shall not elucidate as albuminuria increased leucocytes in the urine fever, chills, nausea bacilluria,

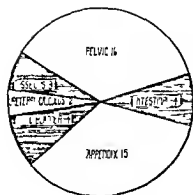


Chart 12 Operations performed

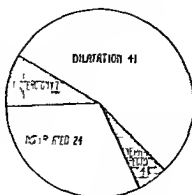


Chart 13 Treatment

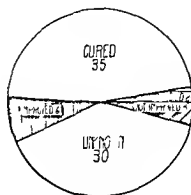


Chart 14 Results

anuria, tympanites abdominal soreness and nervous symptoms as irritability malaise and nervous breakdown.

Another interesting finding was the number of operations some of these patients had been subjected to without relief of their symptoms. For example, sixteen had pelvic operations, four had cholecystectomies and two the removal of ureteral calculi (Chart 12).

To illustrate the attempts made to alleviate the abdominal pain of which these patients have complained we quote Case 9946, a woman 28 years of age. She had suffered the following diseases: measles, chicken pox, mumps, scarlet fever, pneumonia and a tuberculous hip. Her operations were as follows: (1 and 2) the left hip was operated upon twice; (3) appendectomy; (4) salpingectomy; (5) 3 months later a partial oophorectomy; (6) tonsillectomy and adenoidectomy; (7) an operation for intestinal adhesions; (8) therapeutic abortion at 5 months; (9) trachelorhaphy.

Her chief complaint was a little blood in the urine 8 years previously, with frequency of urination and tenesmus. She was subject to chills and fever with a dull pain in the right abdomen and back for a number of years. The pain had not been relieved by any of her operations. She was very nervous and sought relief from this right-sided pain. A urological study located a stricture in the middle third of the right ureter.

TREATMENT

Three or more dilatations were performed in 41 of these patients (Chart 13). Usually

conditions were improved after the second or third. Twenty-four of the patients were not treated. They came in for diagnosis only, and it was impossible to follow them. A number, however, were relieved after the dilatation attending the renal study. Whether this was genuine relief with all of them or simply fear of another renal study, is not known. Seven patients were treated by ureterotomy. In these cases the stricture was so tight that it was impossible to pass the smallest bougie, as in the following case:

CASE 915: A male 30 years of age with a history of diphtheria at 12 and a left-sided colic 6 years ago. Since that time he has had several attacks. Two weeks ago he had a severe attack of pain in his left side and back, radiating into the groin and testicle. He had burning urination with hematuria, no urinary infection was present. An impassable stricture was found in the left ureter 5 centimeters from the orifice. A week later this patient developed a chill and a temperature of 101.8 degrees. Micturition was frequent and painful. The abdomen was tender, especially on the left side. There was some nausea and vomiting. A week later he was cystoscoped again and a No. 4 lead catheter was worked through the stricture. A pelvis containing 35 cubic centimeters of urine was found. Three weeks later this stricture contracted again and could not be opened. The patient was in intense pain and was gradually being worn out by continual colic. An extraperitoneal exposure was made of the left ureter. The ureter at the pelvic brim was well distended with urine; it was spindle-like and indurated. A stricture was found 5 centimeters from the bladder which was bulbous and edematous. It was opened and dilated to No. 12 French. After a prolonged convalescence the patient entirely recovered, and in a period of 3 years has had no subsequent attacks. He is perfectly well with negative urinary findings.

CASE 10160: A male 41 years of age. This patient's previous history developed nothing of interest. His



Fig 1 Case 11613 Male, age 48 repeated right sided colic which persisted after appendectomy. Stricture of upper third of right ureter. Entirely relieved by ureteral dilatation.

first attack of pain came on a week before we saw him, waking him up out of a sound sleep shortly after midnight. This attack of left sided colic lasted 2 hours. Within the next few days he had three more attacks. Morphine was necessary to control his pain. His urine was clear and showed no pathology. This pain radiated from the left kidney to the outside of the left hip. A renal study showed no evidence of calculus. A ureterogram revealed a stricture of the left ureter 15 centimeters from the bladder, with considerable dilatation of the ureter above it and a dilated renal pelvis. He was subjected to three dilatations without relief and the stricture finally contracted, and nothing could be passed. The left ureter was exposed extraperitoneally. The middle and lower thirds were found to be overdistended, and a centimeter in diameter. It was opened at the brim of the pelvis, and a flexible metal bougie was passed upward and downward. The vesical orifice was completely obstructed, and it was impossible to get through it. This patient was operated upon only after all attempts of intravesical dilatation of the stricture failed. An extraperitoneal ureterotomy was decided upon. Finding it impossible to pass a bougie into the bladder, the ureter was drained to relieve the patient of pain and to put the uretero-vesical orifice at rest. After 3 weeks draining the wound healed. Since the operation the patient has been subjected to dilatation five times. His stricture is still present but it admits a No. 5 catheter. As far as symptoms are concerned he has completely recovered.



Fig 2 Case 10915 Female, age 22, attacks of left sided colic with collapse. Two strictures of left ureter treated with bulbs and relieved of her pains.

These cases are quoted to show that it is impossible to dilate some of these strictures, and if dilated too much have a tendency to contract entirely. Four of the patients required nephrectomy. We shall quote Case 9446.

This patient was a male, 42 years of age. He was taken with two attacks of right sided colic in 1 week. The second one came on at midnight, and was very severe. He was sent to the hospital and discharged the next day as the pain had subsided and he felt comfortable. Two days later he had another attack which lasted 3 hours. Several roentgenograms were negative for stone. He then submitted to a renal study. The right ureteral orifice was large and oedematous. It was obstructed 1 centimeter from the bladder no urine coming through. It was impossible to pass the catheter on this side. An indigocarmine test showed a faint trace of color in 15 minutes. As the patient was in great pain an exploration of the ureter was made. The ureter was greatly distended and near the bladder considerable oedema was found, due to periureteral inflammation. A No. 7 catheter was passed down toward the bladder but was obstructed. Finally a No. 4 catheter was worked through into the bladder. Grating was felt, and after considerable difficulty a tiny calculus was worked up through the ureteral opening and delivered. Another attempt was made to dilate this

stricture but was not successful. The ureter was drained and the wound was allowed to heal. Five weeks later the patient again complained of colic like pain in the left side. He was cystoscoped and a No. 5 catheter was passed through the stricture for 25 centimeters. Seven months later the patient again had colic of a severe type and an attempt was made to catheterize the right ureter but an impassable obstruction was encountered 10 centimeters from the orifice and all attempts to get through it were futile. He continued to have fever, chills and colic. Apparently the ureter was completely obstructed and there was no hope of relieving this obstruction. Four days later a nephrectomy was performed. The kidney was of normal size but very blue. The ureter, pelvis and calyces were considerably dilated.

This case illustrates the possibility of a very small stricture not yielding to treatment and completely closing the ureter.

CASE 10863. Female, 33 years of age. For 5 months this patient had repeated attacks of left renal colic radiating into the groin. They were very severe and accompanied by hematuria. There was considerable nausea with soreness in the left side. A roentgenogram showed a calculus in the lower third of the left ureter. An obstruction of the left ureter 20 centimeters from the bladder was encountered. A ureterolithotomy was performed. The calculus was found in the lower third of the ureter impacted above a stricture. Although it was very rough it was successfully delivered through the incision with forceps. A tear occurred in handling the ureter which was repaired with fine catgut. The patient developed a wound infection and drained pus for several weeks. After 2 months the urine was still flowing through the abdominal wound. An attempt was made to catheterize the ureter through the bladder but an impassable obstruction was found 7 centimeters from the orifice. Six attempts on 25 many occasions were made to get a whale bone bougie through this stricture all without avail. Chromocystoscopy was employed but no dye came through the left side and apparently it was hopelessly obstructed. Due to the inflammatory condition of the wound it was impossible to do a ureteral implantation on this patient so we did a nephrectomy.

This illustrates an accident and the result in a traumatic stricture of the ureter which may happen.

RESULTS

Forty six per cent of the cases are classified as cured (Chart 14). By this is meant that after three or more dilatations all their symptoms have cleared up and remained so for 6 months or longer. This includes all cases treated up to the past few months.

The results are unknown in 39 per cent of the cases. Many patients were examined only and we had no opportunity to treat them. Of this group as mentioned before a number were relieved by the renal study. Eight per cent were improved. By this we mean that their symptoms were somewhat relieved but not entirely. Four per cent were not improved (Chart 14).

Two of the patients died and it is strange that both of these were physicians, one was over 60 years of age and had a pyonephrosis as the result of a ureteral stricture. A nephrectomy was performed and he died the following day of uremia. The second was 47 years of age. The ureter was dilated a number of times and several ureteral calculi were passed. While on a vacation in the South he developed a fatal uræmia.

SUMMARY

1. Ureteral stricture is not an uncommon disease.

Local infection and diseases caused by streptococcal infection seem to play some part in the formation of the ureteral stricture.

3. Ureteral stricture is more frequent in women than in men.

4. Renal colic is frequently caused by ureteral stricture and simulates calculus.

5. Many of the obscure abdominal pains may be traced to ureteral stricture and are relieved by dilatation.

6. A number of abdominal operations have been performed needlessly as ureteral stricture was undiagnosed and was the cause of the symptoms present.

7. Some strictures are not dilatable and must be subjected to ureterotomy or incision.

LITERATURE

1. CABOT: Modern Urology, Vol. II, p. 90.
2. LISBONATH: Ureteral stricture, kink and abnormal insert. Surg., Gynec. & Obst. 1925, xli, 558.
3. GOLDSTEIN: Ureteral stricture of the male. South M. J. 19, xiv, 555, '29.
4. GRAVES and DAVILOFF: J. Urol. xiv, 10.
5. HUYER: Ureteral stricture. Johns Hopkins Bull. vol. xxxv, No. 323, Jan. 1915.
6. Idem: J. Am. M. A., lxxvii, 509, 516.
7. Idem: Ureteral stricture. John Hopkins Bull. lxxvii, 510.
8. KELLY: Structure of the ureter. J. Am. M. A., 190, lxxvii, 363.
9. ROSENHEIM: The tonillary ring and pyonephrosis: a portals of entry of infectious diseases. Bull. John Hopkins Hosp. 1908, xiv, 338.

THE VALUE OF ENTEROCOLOSTOMY COMBINED WITH ENTEROSTOMY IN ACUTE PERITONITIS¹

BY JOHN WESTLY LONG MD MC FACS GREENSBORO NORTH CAROLINA

THE purpose of what I shall say is 'to stir up your pure minds by way of remembrance regarding the pathology of acute peritonitis and its allied conditions also to point out the rationale of the treatment proposed. That surgeons generally understand peritonitis, I am sure but that we fully appreciate the significance of the relationship between the various morbidities involved is not quite so certain. The great Agassiz said "Facts in themselves are stupid things until they are linked together"

CAUSES

Peritonitis may be due to any of a large number of conditions, but since the vast majority of cases are the result of appendicitis we will, by way of illustration discuss this cause only.

Appendicitis has no limitations. Many years ago I heard John B. Deaver read a paper, the title of which was 'The possibilities of appendicitis have no limitations.' That laconicism is as true today as it was when first uttered by that master surgeon.

Appendicitis, even of the acute type, does not always cause peritonitis. If the appendix is post cæcal an abscess forms sometimes of enormous size reaching as high as the liver surrounding the kidney. Should the abscess leak, either by rupture or diffusion peritonitis follows with all of its consequent evils.

There is another type of appendicitis that may destroy life without the development of peritonitis, or if it should develop it is a late manifestation. I refer to cases in which septic thrombi form in the appendicular group of veins and the infection passes upward through the ileocolic superior mesenteric and portal veins, with the result that disseminated abscesses are formed in the liver. In my experience this type is always fatal.

When an infected appendix is situated in its normal position protective adhesions often form with a resulting abscess. When these

adhesions form widespread peritonitis does not occur so readily. It is the appendix that hangs down in the pelvis which is most likely to cause peritonitis of the type that we have under consideration.

We were taught in the early days much dead house pathology and its importance certainly cannot be overestimated. But in these later years we have learned the inestimable value of pathology *in vivo*. Since pathology in the living is progressive we must follow the successive changes or natural history if we would have a comprehensive knowledge of our subject. In appendicitis and its results this fact is very forcefully illustrated.

PELVIC PERITONITIS AND ILEUS

The gangrenous appendix lying low in the pelvis produces peritonitis, the local peritonitis attacks the adjacent coils of intestines, the peritoneal covering loses its lustre, becomes oedematous the muscularis is invaded by the bacteria and we soon have a typical adynamic ileus due to paresis. A gut in this condition is lifeless, the walls being stiff like a rubber hose. The ileus occurs at two points in the terminal ileum and in the pelvic portion of the sigmoid.

When, in these cases, a free bowel movement is secured we may take it as clinical evidence that the pelvic portion of the sigmoid has not yet become totally paralyzed. I used to wonder why there was so much tympany in the upper abdomen before peritonitis had spread very high. Now that the pathology is better understood it is perfectly obvious that gas is retained in the colon because of the ileus in the lower sigmoid through which neither feces nor flatus can pass. By this time the patient is on the highway to the cemetery, for it is a surgical axiom that if the bowels move the patient recovers, otherwise he dies.

It would be bad enough if the pathological changes ended with the pelvic ileus but unfortunately they are progressive. Both the

¹Read before the Southern Surgical Association Louisville Kentucky December 16 1915

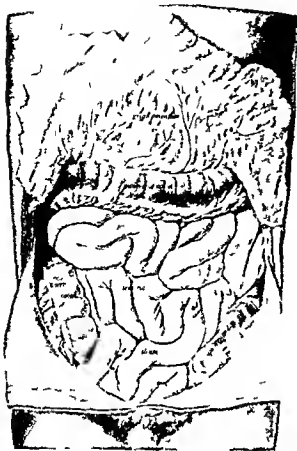


Fig. 1 The relation of the colon and small intestines (Sabotta)

peritonitis and the intestinal paresis advance steadily upward until if they are not checked in their headlong career we have a general peritonitis and the ileus involves practically the entire bowel under which circumstances the patient is doomed

Intestinal toxæmia Long before this stage is reached another lethal condition develops namely intestinal toxæmia which is perhaps more fatal than the peritonitis *per se*

To enumerate the pathological stages, we have the gangrenous appendix the pelvic peritonitis the duplex obstruction of the ileum and sigmoid, the ascending peritonitis the steadily advancing paresis the intestinal toxæmia and too often death

COMPLICATIONS

Nor have I mentioned the complications that are common in acute peritonitis, one of



Fig. 2 Gangrenous appendix with obstruction of ileum and sigmoid (Re-drawn from J. Simpson Handley *British Journal of Surgery*)

the first being acute nephritis albumin one to four plus with the field full of granular casts This frequently happens early in the game I used to wait until the kidneys cleared up before operating but I have long since learned that the best way to relieve the kidneys is to remove the appendix it being the cause of the nephritis Therefore I regard the kidney lesion as additional indication for operation Acute dilatation of the stomach is a significant complication Myocarditis restlessness and prostration augment the group of complications so familiar to every surgeon

TREATMENT

Under the circumstances what is the rational thing to do other than to remove the appendix and drain the abdomen or having done this, we find that the patient continues to grow worse? I have pointed out on numerous occasions the value of enterostomy in cases of ileus My own experience with that of a multitude of other surgeons, is proof of the value of this life saving procedure Enterostomy is indicated in almost every variety of obstruction especially if it is done early before extensive paresis of the intestines has developed However, it is the mechanical

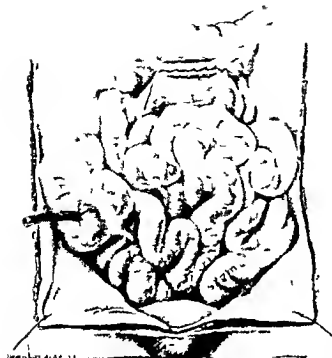


Fig 3 Enterocolostomy and caecostomy (Re-drawn from J Sampson Handley, *British Journal of Surgery*)

type of obstruction that most readily yields to simple enterostomy. Sometimes a second enterostomy, if placed high, will turn the tide when the first has failed to relieve

CASE 1 Miss L A a young woman from the North Carolina State College for women was referred by Dr Anna M Gove, the college physician. The patient had a fulminant case of appendicitis. I operated promptly but the infection had evidently invaded the peritoneum and ileus developed 2 days thereafter. To overcome the obstruction I did an enterostomy utilizing the first distended coil that presented itself. Temporary relief was obtained but by the next day it was obvious that the patient was losing ground. I determined on a high enterostomy which was done through a right rectus incision. The patient made a perfect recovery. What I had succeeded in doing was to get above that portion of the gut that was paralyzed.

But there are certain cases in which enterostomy cannot give relief, no matter where the tube is placed. This is due to the *duplex character of the ileus* and to the fact that penstalsis is in abeyance throughout a large portion of the intestines. A high enterostomy will drain the upper bowel but not the colon.

Mr H Sampson Handley of London in his eighth Hunterian lecture¹ describes a combi-

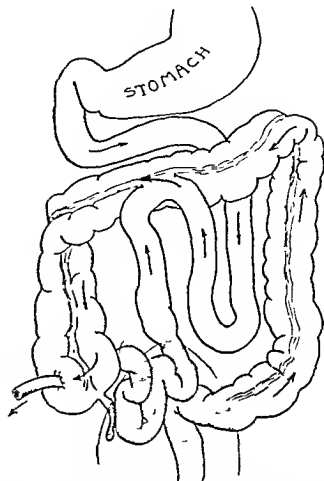


Fig 4 Shaded portions show points of ileus. Arrows show fecal current diverted into colon and out through caecal tube.

nation of operations designed to overcome the complex pathological conditions found in these cases. I believe the operation is based on sound surgical principles. Drainage of the intestines is the essence of the Handley method and the drainage must be from above the obstruction. Now since the ileus occurs at two places, there must be as many drains. Handley anastomoses the small intestine to the transverse colon and then relieves the overloaded colon by a tube placed in the caecum. As Mr Handley says, he establishes 'an emergency alimentary canal.' He sets forth the reasons for this procedure with great clearness. Handley reports 5 cases upon which he has operated, all the patients recovering. However, 1 died 2 months later from metastatic abscesses.

Drainage Call it "intestinal plumbing" if you like, but it is marvelous how quickly and completely these two avenues of escape will relieve the situation. That portion of the

¹Brit J Surg 1935 January



Fig. 5. Omentum securing enteric tube—J. W. Long's method.

alimentary tract above the anastomosis including the stomach promptly empties itself into the colon while reverse peristalsis soon begins to unload the distal gut through the anastomosis and the whole volume of toxic material finds exit through the cecal tube. The cecal tube may also be utilized to flush the colon with nutrient solutions which materially aid in overcoming the dehydration of the patient. After a time nature overcomes the obstruction in both ileum and sigmoid and the alimentary bolus passes on *per se* *naturalis*.

CASE. The first patient on whom I did a combined enterocolostomy and excostomy was R. R., a girl 13 years old. Her physician, Dr. A. C. Whitaker, Julian, North Carolina, saw her on the third day and brought her at once to the Wesley Long Hospital. A very member of the patient's family was or had been sick with influenza. The respiration 30-40, temperature 103 degree F., pulse 130 in addition to the abdominal symptoms were typical of acute appendicitis.

My practice is to operate immediately in the cases but this child's pulmonary complication caused me to hesitate. The next morning I opened the abdomen and found a gangrenous appendix hanging over the rim of the pelvis with peritonitis pronounced and a pint or more of cropus. The appendix was removed, the pelvis drained and the incision partially closed. Thirty-six hours later the girl was doing badly with marked evidences of rapidly spreading peritonitis. No flatus or bowel movement had been secured. Muscular resistance and tenderness were especially marked below the umbilicus. The upper abdomen was comparatively flat and soft, the pulse 140, respirations 32.

Operation for peritonitis and ileus. Under light ether and novocain anesthesia a high rectus incision was made, the transverse colon drawn out and a coil of fairly normal looking gut just above the rising tide of peritonitis was brought alongside and anastomosis quickly done without clamp. The small gut utilized proved to be the distal portion of the jejunum. The appendiceal incision was then opened and a tube placed in the cecum. The omentum was sutured about both the anastomosis and the cecal tube.

While this patient was quite ill with peritonitis, influenza and pneumonia she made a good recovery, leaving the hospital 30 days from the time she entered. Once the convalescence was fairly well on its way she gained very rapidly, putting on 35 pounds the first 2 days she was in the hospital. On returning home the patient continued to improve in every way. Her weight increased from 95 to 110 pounds within a few weeks and she resumed her work in the house and field being a farmer's daughter.

Ileus. On November 11, about 5 months from the time she first entered the hospital after doing a day's work, she ate heartily of cabbage and other things for supper. During the night she became nauseated, had epigastric pains and vomited two or three times. This condition continued for 3 days, during which time no bowel movement was secured. She was brought to the hospital by her physician, Dr. Whitaker. A gastric lavage was done which relieved the vomiting but the abdominal distress continued. There was not much tympany except in the upper left quadrant which was at first supposed to be due to dilatation of the stomach. But the tympany did not disappear after the lavage. A diagnosis of acute ileus was made and the abdomen opened at the site of the former rectus incision. The jejunum was found absolutely obstructed by adhesions situated 4 to 6 inches above the anastomosis. The head of the anastomosis was not involved. I first thought of disconnecting the jejunum from the colon but the union was evidently not at fault and so perfect that I decided not to do this. The anastomotic opening, which was 2 inches long when first made, had become reduced to the size of the forefinger. The obstructing adhesions were too small, as well as other adhesions lower in the abdomen, which gas and fluid feces immediately passed on into the ileum and the colon. To insure a perfect emptying of the distended jejunum an enterostomy tube was introduced. Within less than a week the patient was sitting up and remained in the hospital only 16 days. When the enterostomy tube was removed the incision closed promptly, it always does when it is properly well guarded by the omentum. She gained rapidly in weight, strength and marish and was eating three square meals a day when she was dismissed.

I have operated on one other patient by the Hendley combination of enterocolostomy and excostomy. The case shows the value of

the method in the face of a serious complication of a different type from that just reported

CASE 3 Mrs C P was brought to the hospital August 24 1923 by her physician Dr P C Carter Madison North Carolina with acute appendicitis and beginning diffuse peritonitis She was also 4 months pregnant

On opening the abdomen I found the appendix hanging over the brim of the pelvis It was as large as one's thumb $3\frac{1}{2}$ inches long and gangrenous The pelvis and the right iliac fossa were filled with thick yellowish seropus The peritonitis was rather widespread The appendectomy was done by our usual technique two cigarette drains and a Penrose drain were carried to the bottom of the pelvis and the incision partially closed

The patient continued quite ill, was prostrated the pulse was frequent and feeble the stomach became acutely dilated vomiting was frequent and the peritonitis slowly but steadily advanced upward The Murphy drip was kept going continuously No stool nor flatus of consequence was passed By the fourth day it became evident that the patient had a well established ileus Despite her desperate condition it was decided to do an entero colostomy and a caecostomy Through a high rectus incision the distended transverse colon was exposed and a coil just above the high water mark of the peritonitis was brought alongside and anastomosed with the colon The caecum could be reached through the rectus incision and a rubber tube was sutured into it Both the tube and anastomosis were safeguarded with omentum Following the operation the patient did not vomit another time, gas and fluid feces escaped readily from the colon through the caecal tube and in

due time the bowels moved naturally Six days after the second operation the patient aborted painlessly and without disturbance She continued to improve and left the hospital in 27 days from the time she entered having gained considerable weight and strength

Follow up A month later this patient re-entered the hospital complaining of indigestion and prostration The abdomen was flat and flaccid with no tenderness A gastric lavage was done and Murphy drip given continuously We considered the propriety of freeing the anastomosis but the patient improved so promptly being upon full diet within a few days that it was not considered necessary A barium series showed that the anastomosis was functioning This patient's life was most certainly saved in the first instance by the anastomosis and the caecostomy

VALUE OF HANDLEY'S METHOD

Mr Handley says 'The treatment of these very acute cases of general peritonitis makes demands not only on the surgeon's initiative and technical skill but on his moral courage and resolution If the accepted methods fail to produce relief the painful necessity of advising a second operation must be faced without delay Only thus can a disaster be averted' Mr Handley's logic is incontrovertible His experience of 5 successful cases with the 2 I herewith report is evidence that enterocolostomy with caecostomy may salvage certain patients who could not be rescued by any other known method

PATHOLOGICAL FRACTURE OCCURRING IN CHARCOT'S DISEASE OF THE HIP JOINT

REPORT OF A CASE TREATED BY THE WHITMAN ABDUCTION METHOD

By ALVA THOMAS M.D. DENVER, COLORADO

PATHOLOGICAL fractures occurring in Charcot's joints is not an uncommon complication of tabes dorsalis the accident often occurring very early in the disease. The outlook has always been considered a rather hopeless one non union resulting in the majority of cases this being especially true with involvement of the hip joint. The problem is serious enough with fractures occurring in otherwise normal hip joints and when complicated by the destructive process of a tabetic arthropathy these cases are usually regarded as so hopeless that often no serious attempt is made to treat them the patient being condemned to the life of a hopeless cripple.

REVIEW OF THE LITERATURE

A study of the literature shows quite conclusively the pessimistic attitude held by most surgeons and the poor results obtained by attempts at treatment.

Bougle (2) reviews 59 cases of fractures occurring in tabetics 3 of which involved the femoral neck. Non union occurred in more than 50 per cent of these cases. It is his opinion that rapid consolidation does not occur in tabetic fractures and that the true figures are even higher than those stated.

Guichard (8) reviews 100 published cases of tabetic fractures union occurring in about one half of the cases reported. In his own series there were 3 cases of hip joint fractures, all of which resulted in non union.

Delay (5) reports 1 case of spontaneous fracture of the femoral neck occurring in a tabetic. This patient was unable to walk 3 years after the accident.

Jaboulay (11) reports a similar case treated by plaster immobilization. In spite of the enormous overgrowth of bone a pseudarthrosis resulted, and the patient was unable to walk at the end of 55 days.

Thiem (14) operated on a hip joint fracture in a tabetic and found a large cyst and calci-

fied bone deposits. The result of the operation was unsatisfactory as no union occurred.

The youngest case found in literature is that reported by Elmer (6) in which pathological fractures occurred in both hip joints in a child of 14 years with juvenile tabes dorsalis. In this case the heads of both femora were almost completely destroyed.

Sutherland (13) reports a total of 18 fractures occurring in Charcot's joints seen at the Mayo Clinic 7 of which involved the hip joint. The writer is indebted to Doctors Sutherland and Henderson who have kindly sent a detailed report of these cases involving the hip joint. Non union resulted in all 7 of them.

It is encouraging however to note that all authorities do not agree that poor results are universally the case in these injuries occurring in tabetic arthropathies. Flatow (7) reviews 67 fractures occurring in tabetics 4 involving the femoral neck. It is his conclusion from a study of these cases that the rapidity of consolidation in tabetic fractures is surprising the time involved usually being less than that required for normal bone.

Kredel (12) in a study of a large series of tabetic fractures, maintains that slow healing and poor results are due to careless treatment. He urges that every tabetic joint affection be treated according to the same principles as a serious joint injury occurring in a normal person. He reports 9 cases of fractures of the femoral neck apparent union resulting in 6 of them.

Bowlby (3) urges that an encouraging view be taken of the surgical complication of tabes and that the fractures be treated as those occurring in normal bone. He cites several instances of union following spontaneous fractures in tabetics.

I. Baum (1) in a very thorough study of pathological fractures occurring in tabetics reports 11 cases and gives a complete review

of the literature. The total number of cases reviewed by him was 72, 12 of which were femoral neck fractures. Union occurred in about one half of the total cases studied. In his own series there were 3 cases in which the femoral neck was involved. Good functional results were obtained in 2 of these. Baum is of the opinion that the treatment in all of the cases reviewed by him has been universally poor. He maintains that fractures in tabetics have the same tendency to heal as in normal bone and that the functional results should be normal in the large percentage of cases provided proper mechanical treatment is carried out and complications carefully guarded against. He is also of the opinion that with modern methods of treatment, newer studies are required in order to interpret results properly. He further states that, according to most reports, operative interference has not been very successful, but in his own experience he has succeeded in obtaining very good results following operative treatment.

F. Cotton (4) in a discussion of the surgical aspects of Charcot's joints, urges a more encouraging viewpoint in regard to the treatment of these cases. He asks the surgeons to "Think of these lesions—as a joint disease occurring in syphilitics, not always or even usually crippled by ataxia, a lesion not completely curable, but not without power of repair or destined to inevitable progress, but capable under proper handling of restoration to safe use." He cites several cases, one of which was a hip joint, whereby good functional results were obtained with proper mechanical treatment and operative interference where necessary, supplemented by active antiluetic treatment.

Hoguet (10) reports a case of pathological fracture occurring in Charcot's disease of the hip joint in which he did a reconstruction operation, removing the loose head from the acetabulum. The functional result in this case was considered very satisfactory.

Further investigation by Henderson and Sutherland (9) of the cases of tabetic fractures of the hip joint reported from the Mayo Clinic revealed the fact that although there were no cases in which union occurred, some of them had remarkably good function. The majority



Fig. 1 (left) Roentgenogram taken April 13, 1925, 6 weeks after the injury, showing Charcot's disease of the hip joint with fracture at the neck of the femur.

Fig. 2 Roentgenogram taken September 2, 1925, following treatment by the adduction method. There is apparently bony union at the site of the old femoral neck fracture. The greater trochanter appears hypertrophied and there is considerable new bone formation and some loose bodies about the joint.

of these cases came to the Clinic long after the occurrence of the fracture and had received little or no treatment at the time of the injury.

CASE REPORT¹

Mrs. B. D., a housewife, age 54 years, was seen April 13, 1925, complaining of an injury to the left hip joint. On February 8, 1925, while walking on a polished floor, she stumbled over a rug and fell striking her left hip. She managed to get up without assistance and was able to walk a few steps to the bed but with considerable difficulty. There was only moderate pain. On attempting to walk a few hours later she was unable to do so. An osteopath was called who told her she had strained her hip and treated her for 8 weeks by manipulation and massage. During this period the patient was able to walk to the bath room by holding on to a chair, but at no time was she able to bear full weight on the affected limb. There was very little pain but the hip seemed to give way with her.

Past history. The patient has been previously under the care of a neurologist, Dr. George Moleen, having been treated since 1909 for *tabes dorsalis*. When first seen by him she complained of a blurring of vision, dull pains in the legs, unsteadiness of gait and occipital headaches, the symptoms having been present for about a year.

The examination at that time showed a moderate ataxia, absent knee jerks, Argyll Robertson pupils, and a positive Romberg sign. His diagnosis was *tabes dorsalis*. The laboratory examination made

¹This patient was admitted to St. Luke's Hospital, Denver, Colorado, on the service of Dr. S. Fosdick Jones, and the case is reported with his permission.

May 10 1919 was as follows: blood Wassermann strongly positive spinal fluid 225 cells luetic gold curve globulin 2 plus and Wassermann reaction positive.

The patient received intraspinal treatment according to the Swift Ellis method throughout 1919 and the spring of 1920. The final laboratory report May 26 1920 was as follows: spinal fluid 19 cells luetic gold curve globulin 3 plus Wassermann reaction weakly positive. When last seen a few months prior to her accident the visual disturbances had disappeared the pains were much less and the ataxia not so marked although she was compelled to use a cane.

Family history: Mother and father are both dead. Her brand died of apoplexy. There were no children.

Examination April 13 1925. The patient is lying in bed with the left thigh adducted and rotated externally. She is unable to walk without support nor can she raise the left leg from the horizontal with the knee extended. The left lower extremity is 3.4 inch shorter than the right measured from the anterior superior spine of the ilium to the external malleolus. The left trochanter lies 3.4 inch above Nelaton's line. In the left groin below Poupert's ligament there is an indefinite brawny mass which moves on rotation of the femur. Abduction and internal rotation are limited. There is very little pain occasioned by moving the limb. The knee jerks are absent on both sides. The pupils react to accommodation but not to light.

Diagnosis: Intracapsular fracture of the neck of the left femur.

Röntgenographic report: The roentgenograms were taken by Dr. Boulog April 13 1925 (Fig. 1) and show a fracture of the neck of the left femur with upward displacement of the shaft considerable loss of bone an irregular new bone formation and the presence of bony debris about the joint. This is probably a Charcot's joint.

Treatment: The patient was admitted to St. Luke's Hospital and on April 14 1925 under ether anesthesia the left hip was internally rotated extended abducted to an angle of 45 degrees and immobilized in a plaster of Paris spica extending from the toes to the axilla according to the method described by Roy L. Whitman.

She was taken home from the hospital at the end of 3 weeks with the plaster intact. At the end of 7 weeks the plaster was removed and the patient kept in bed for 4 more weeks receiving daily massage and passive motion. At the end of 11 weeks she was allowed to sit up in a chair and after 12 weeks was allowed to walk. Because of the ataxia she was unable to use crutches with safety but she was able to walk with the aid of a chair by bearing only a little weight on the affected limb. Very gradually she was allowed to bear more weight and was finally given a cane.

When examined November 15 1925 4 months after treatment was started the patient was able to bear full weight on the left leg without discomfort and

she walked with the use of a cane. Thus she had done for several years because of her ataxia. The ataxia was no greater than previous to the injury. She had a moderate left limp. There was slight external rotation but no adduction of the thigh. She was able to flex the thigh with the knee extended. The left lower extremity was 3 1/4 inch shorter than the right. Range of voluntary abduction was 40 degrees and of voluntary flexion 75 degrees.

Röntgenographic report: The roentgenograms taken by Dr. S. B. Childs on September 2 1925 (Fig. 2) show apparently solid bony union at the site of the old femoral neck fracture considerable new bone formation and some loose bodies resulting from the tabetic arthropathy. The great trochanter is hypertrophied and is riding high in relation to the head.

CONCLUSION

This case is considered of sufficient importance to record in surgical literature in that it shows that a good functional result can be obtained in fractures of the hip joint with tabetic arthropathy in which the same mechanical treatment is carried out as in fractures of the femoral neck occurring in normal bone. It is the writer's opinion that the abduction method of plaster immobilization as described by Whitman (15) is by far the most efficient and comfortable method of treatment of hip joint fractures in normal or diseased bone and it was by this method that the case described was treated. The functional result is excellent and there is apparently a bony union.

As has been pointed out by Brum (1) Cotton (4) and others there is entirely too much pessimism on the part of most surgeons regarding the final results that can be obtained in these fractures occurring in tabetic arthropathy. As a result of such an attitude many patients have received no efficient treatment and the poor results obtained have only served to confirm the original opinion held by the attending surgeons.

As previously mentioned many of these accidents occur very early in the course of the disease often in the pre-ataxic stage and were it not for the disabling injury these patients would be able to live fairly normal and useful lives for many years especially if active antiluetic treatment is carried out.

It is strongly urged therefore that the condition be looked upon not as a hopeless

complication of tabes dorsalis, the patient being condemned to helpless invalidism, but as an injury with the same tendency to heal as one to normal bones and joints when treated by means of the same mechanical principles

BIBLIOGRAPHY

- 1 BÄLM I. Knochenbrüche bei Tabes und deren aetiologische Stellung. *Deutsche Zeitschrift für Chirurgie* 1907, lxxvii 1
- BOUGLÉ Contribution à l'étude des fractures spontanées. Thèse de Paris 1896
- 3 BOWLEY Surgical complications of tabes. *Brit Med J* 1906 1
- 4 COTTON F. Some surgical aspects of Charcot's joints. *Ann Surg* 1901 lxxii 483
- 5 DELAY Tabes a symptôme initial de fracture etc. *Lyon med* 1904 cxix 39
- 6 ELMER W. G. Juvenile tabes dorsalis with dislocation of hips from Charcot's disease. *Med J & Rec Sup* 1904 cxix 6
- FLATOW Die trophischen Störungen bei Tabes dorsalis. Inaugural dissertation Berlin 1888
- 8 RICHARD A. Contribution à l'étude des fractures spontanées dans le tabes. Thèse de Paris 1902
- 9 HENDERSON M. S. and SUTHERLAND CHARLES G. Personal communication
- 10 HOGGIE Pathological fracture of neck of femur reconstruction operation. *J Bone & Joint Surg* 1904 vi 710
- 11 JABOULAY Fracture tabétique du col fémoral avec callus exuberant etc. *Rev internat de med et de chir* 1900 cxviii 221
- 12 KREDEL Die Arthropathien und Spontanfrakturen bei Tabes. *Samml klin Vorträge* 1888 *Chir* No 96 291
- 13 SUTHERLAND CHARLES G. Charcot's joint. *Radiol* 1905 iv 323
- 14 TITMUS Bruch des rechten Schenkelhalses bei einem Tabesichen. *Monatschr f Unfallheilk* Leipzig 1904 xi 5
- 15 WHITMAN ROYAL. The abduction treatment of fractures of the neck of the femur. *Ann Surg* 1905 lxxxi 34

THE CONCURRENCE OF TUBERCULOSIS AND CANCER OF THE BREAST

REPORT OF A CASE

By LAWRENCE WELD SMITH, M.D. AND ROBERT I. MASON, M.D. BOSTON

From the Laboratory of the New England Deaconess and Baptist Hospitals and the Department of Pathology Harvard Medical School

TUBERCULOSIS of the breast is a comparatively rare disease of which Deaver and McFarland (7) in their book on *The Breast Its Anomalies Its Diseases and Their Treatment* could find in the literature only 96 recorded cases 78 of which they accepted chiefly on the basis of microscopic diagnosis And the concurrence of tuberculosis and carcinoma in the same breast is apparently a clinical rarity Bastedo (1) in a general article on the association of cancer and tuberculosis in the same individual gives perhaps the most complete discussion Rodman (18) in 1909 gave a brief résumé of tuberculosis of the breast Klose (11) in reporting a case in a woman of 25 the year after reported he could find only 17 cases of associated cancer and tuberculosis of the breast in the literature but several of these were not confirmed microscopically In 1919 Broders (4) reported 20 cases of tuberculosis associated with malignant neoplasia from the Mayo Clinic He included 2 cases of breast carcinoma in which the patient had an associated tuberculosis which I infer involved the breast The other reported cases are as far as I am aware, included in the articles already quoted I have verified these as far as possible by reference to the original papers

Moak (15) found 1 case in which the lesions occurred in combination in the breast, and 2 in which there was a mammary carcinoma and an axillary tuberculous lymphadenitis Warthin (21) recorded 2 cases 1 in a woman of 40 the other in a patient aged 39, Kallenberg (10) one Pilliet and Pratot (16) a case of scirrhous carcinoma with a tuberculous fistula in a patient 51 years old Scheidegger (19) recorded a case of diffuse adenocarcinoma with tubercle inclusions and axillary tuberculous lymphadenitis Bundschuh's (5) case in a woman of 51 was associated with an old pleuropulmonary tuberculosis Craw-

ford's (6) case presented a single cancerous lymph nodes and a large caseating mass of nodes in the axilla with concurrent lesions of the breast No giant cells were found and no organisms demonstrated but there seems to be no doubt in this case from the described histology Bauer (2) Crawford (6) Fricke (9) Maker (13) Massabeau (14) each report a single case and Franco (8) includes 2 cases The cases are difficult of analysis for they are incomplete in so many details As nearly as I can determine there have been 18 cases recorded in which there seems to be no reasonable doubt as to the existence of the combined lesions in the same breast The ages vary from 25 to 56 years In addition there are a number of cases in which there was a primary carcinoma of the breast and at operation an associated tuberculosis of the axillary lymph nodes was found Among these may be cited the cases of Berger (3) Richardson (17) Deaver and McFarland (7) Lamars (12) Semadim (20) and two of Moaks (15) In these instances it is of course not impossible for a microscopic focus of infection in the breast to have been overlooked

The chief interest in these cases lies in the interpretation of their relationship As has been frequently pointed out several possibilities exist (1) The two conditions may occur independently of one another either simultaneously or consecutively, (2) the tuberculosis may be engrafted on the malignant process as a result of breaking down of the tissue with a resultant increased susceptibility of the individual or (3) the carcinoma may be the result of the chronic irritation of the tuberculous inflammatory process

The old dictum that tuberculosis and cancer were mutually antagonistic has long been discarded But the incidence of the association of the two lesions in the breast has remained very low This can obviously be



Fig. 1. Roentgenogram of chest showing negative pulmonary findings in respect to any latent tuberculosis



Fig. 2. Low power photomicrograph illustrating the scirrhous carcinoma nests of epithelial cells at A and the characteristic giant cell formation associated with the tuberculosis at B

explained in part on the basis of the usual age groups of the two diseases most of the combined lesions being found in relatively young individuals for the usual cancer incidence. In our case the carcinoma seems to be the lesion of longer duration, as it was a typical scirrhous type for the most part, and the tuberculous lesions showed no calcification. It thus suggests the second possibility cited, that of a tuberculous process superimposed on degenerated malignant tissue.

In view of the clinical history we must consider the tuberculosis in the case reported analogous to tuberculosis of the bones or genito-urinary tract, presumably as secondary to some unrecognized focus but for practical purposes, as a primary infection, for which local excision ordinarily is successful.

Mrs. R. H. B., age 38, entered the clinic November 10 complaining of a painful nodule in her right breast. The family history was unimportant with no known incidence of tuberculosis or cancer on either side. She had been married 13 years and had 1 child 10 years old. Since the birth of her child she had had 3 miscarriages.

She had had most of the children's diseases without sequelae. She had influenza in 1918 followed by a dry unproductive cough for about a month. There were no symptoms pointing to anything but the local mammary condition.

The present illness was of about 8 months duration. It began as a sharp knife-like pain referred

to as being 'in the rib, just below the point where the breast joins the chest'. The pain was accentuated by movement but not by deep inspiration. The condition was diagnosed by the family physician as pleurisy and the chest was strapped. The pain subsided temporarily but subsequently there had been frequent exacerbations with a persistent tenderness under the breast. One week before she had first noted a lump and was referred for operation.

The physical examination was negative except for the local breast lesion. In the lower right quadrant of the right breast there was an irregularly shaped firm freely movable mass the size of a golf ball. It was slightly painful on manipulation. No glands were felt in the axilla. There was no tenderness along the rib below the breast at the site where the patient previously complained of pain.

Ray examination. Plates taken of the chest show some slight density at the hili of the lungs and up toward the right apex. There is a dense line across the left apex. The apices themselves are clear. It does not seem like tuberculosis. There is no evidence of malignancy. L. B. Morrison.

Operation. November 20, was performed by Dr. F. H. Lahey, gas oxygen-ether anaesthesia being used. The mass in the lower outer quadrant of the right breast was excised with a wide margin through a submammary incision in the thoracomammary fold. The specimen was immediately referred to the attending pathologist who returned a diagnosis of scirrhous carcinoma. Radical amputation was then done with removal of both pectoral muscles and dissection of the axilla. High up in the axilla were found several glands varying in size from a pea to a kidney bean.

Progress Notes. The patient made a very satisfactory convalescence and was discharged December 5 to her family physician with a clean wound.

Pathological report. The specimen consists of a rather large fatty breast with the pectoral muscles and axillary fat. The breast itself is covered by normal appearing skin which shows no dimpling

The nipple is not retracted and shows no evidence of ulceration. On palpation there is felt a tumor nodule about the size of a walnut just lateral to the nipple in the lower quadrant. This is relatively freely movable in the fatty tissue but is not well defined in its borders. On section it cuts with marked resistance and presents the typical picture of scirrhous carcinoma grossly. There is a dense greyish white connective tissue stroma with a few minute yellowish areas representing glandular structures. Its cut surface is granular in appearance. There are numerous radiating strands of tumor especially toward the superior pole of the breast. In addition to the definite malignant tumor there is noted a diffuse chronic inflammatory fibrosis of the breast with numerous small cystic areas. The largest measuring a centimeter in diameter and filled with a grumous gelatinous material. Many of these cysts are discolored as the result of hemorrhage and blood pigment. No metastases are found grossly in the pectoral muscles but several of the axillary lymph nodes are found to contain dense whitish areas which resemble metastatic tumor tissue. In addition some of the glands show complete caseation with beginning calcification with an inflammatory hyperplasia reminiscent of tuberculosis. Others contain minute yellowish dots which resemble discrete tubercles.

Microscopic examination. The microscopic preparations in general merely confirm the gross pathological findings. In addition however they show the presence of a definite tuberculosis of the breast. There are three distinct pathological processes in the breast: first there is a definite scirrhous type of carcinoma which in some places shows relatively rapid growth with numerous mitoses and a marked increase in cellularity as compared to most of the tumor. This is especially true in the periphery. In the second place there is a diffuse chronic cystic mastitis with many dilated acini lined by a somewhat metaplastic heaped up epithelium and surrounded by diffuse fibrosis and chronic inflammatory cellular infiltration of the supporting stroma. And finally there is a rather diffuse tuberculous process characterized by scattered miliary tubercles containing typical giant cells and presenting a marked epithelioid reaction. Here and there small foci of fairly typical caseation are seen. By special stains in three of these tubercles definite and astonishing bacilli having the morphology of tubercle bacilli were demonstrated. The axillary lymph nodes bear out their gross appearance in that definite tumor metastases are found as well as a typical tuberculous lymphadenitis. This is chiefly of the proliferative type although a few caseous areas are encountered. Evidence of the relatively long duration of the lesion is found in several definitely calcified tubercles.

Pathological diagnosis. Chronic cystic mastitis. Scirrhous carcinoma of the breast with axillary metastases. Tuberculosis of the breast with metastatic axillary tuberculous lymphadenitis.

SUMMARY

A case of associated tuberculosis and carcinoma of the right breast in a woman 38 years of age is reported, without clinical evidence of any other associated tuberculosis.

The literature is reviewed, indicating that there are only 18 other cases which can lay claim to proof concurrence of the two diseases.

The obvious theoretical conclusions are that the two conditions either occur independently or are dependent upon one another in this case the tuberculosis apparently being superimposed on a scirrhous carcinoma.

BIBLIOGRAPHY

1. BASTID, W. A. The association of cancer and tuberculosis. *Med News* 1924 Dec 17 p 1165.
2. BAUER. Ueber Kombination von Carcinom und Tuberkulose in der Mamma. *Cottungen* 1912.
3. BERGER. La tuberculose de la mamelle. *Rev gén de clin et de therap* 1906 xx 22.
4. BRODERS, A. C. Tuberculosis associated with malignant neoplasia: report of twenty cases (two cases of breast cancer). *J Am M A* 1919 lxxii 300.
5. BUCHSCHEN, EDWARD. Ueber Karzinom und Tuberkulose derselben Mamma. *Beitr z path Anat u z allg Path* 1913 14 lxxi 65.
6. CRAWFORD. Quoted by McFarland.
7. DEAYER and McFARLAND. The Breast. Its Anomalies, Its Diseases and Their Treatment. *Blakiston Son & Co* 1911 216 217.
8. ERVEN, F. I. Ueber das Gemeinsame Vorkommen von Tuberkulose und Tumor an demselben Organ. *Arch f path Anat* 1904 lxxvii 30.
9. ERIKSSON, A. Ein Fall von Karzinom und Tuberkulose der Mamma. *Beitr z klin u Tuberk* 1909, viii 309.
10. KALLFATZER. Quoted by McFarland.
11. KLOTZ, H. Tuberkulose mit Adenocarcinom der Brustdrüse. *Beitr z klin Chir* 1910 lxxi 1.
12. LAMON, A. Scirrhus cancer of the breast with tuberculosis. *Ann Soc de med de Univ de Montreal* 1924 May p 419.
13. MAKER, J. I. Carcinoma of breast and tubercular abscess. *J Am M A* 1899 lxxxi 1581.
14. MESSIAS, M. M. Un cas de carcinome et tuberculose de la mamelle. *Montpel méd* 1909 lxxvii 608.
15. MORGAN, H. Carcinoma and tuberculosis in same organ or tissue. *J Med Research* 1909 viii 128.
16. PILLIET and FAYOT. Tuberculose et epithélioma coexistent sur la même sein. *Bull Soc anat de Paris* 1907 lxxv 424.
17. RICHARDSON, K. Chronic mastitis with tuberculous axillary gland simulating carcinoma of the breast. *Lancet* 1919-20 lxxii 52.
18. ROBBINS, W. J. Tuberculosis of the breast. *South M J* 1909 ii 609.
19. SCHIMMELGER (quoted by Franco). Ein Fall von Carcinom und Tuberkulose der gleichen Mamma. *Aran* 1904.
20. SCHUMME, B. Ueber einen Fall von Carcinoma der Mamma und Tuberkulose der Axilladrüse an der selben Seite. *Zurch O J u S* 1898.
21. WATKINS, A. S. Carcinoma and tuberculosis of the mammary gland. *Am J M Sc* 1909 lxxvii 25.

MALIGNANT EPITHELIAL NEOPLASMS, CARCINOMA AND EPITHELIOMA, OCCURRING IN PERSONS UNDER TWENTY-SIX YEARS OF AGE¹

BY I. HAYNIS FOWLER, M.D., ROCHESTER, MINNESOTA

Fellow in Surgery, The Mayo Foundation

FROM the time of the earliest medical writings to those of the present day, cancer has been defined and discussed as a disease of middle or late life. Malignant disease is likely to be excluded from the realm of probability when a patient gives his age as 25 or less. Especially is this true of carcinomata or epitheliomata, that is those forms of neoplasm derived from epithelial structures in contradistinction to those of connective tissue origin, the sarcomata. The latter have long been known to be common in youth and are therefore not considered in this study.

The basis of this paper is a clinical and pathological study of 112 cases of pathologically demonstrated carcinoma and epithelioma in patients under 26 years of age, operated on at the Mayo Clinic between January 1, 1914 and January 1, 1924.

In 1887 Sir James Paget said: "The definition of cancer is impossible. Definitions are mere helps for arrangements and belong only to sciences more exact than pathology. Better to think of diseases as in groups with borders that are not clearly marked, or as nations with ill defined frontiers and with inhabitants in terminology and intermarrying."

And today pathology is still a very inexact science. Opinions of equally capable pathologists differ with regard to the pathogenesis and classification of many tumors. For this reason, more than 100 cases of mixed tumors of the parotid, testicle, kidney, and of the appendix (so called carcinomata), which fall within this age limit and many of which are undoubtedly of epithelial origin have been excluded from this series, although they were studied pathologically.

INCIDENCE

The incidence of malignant epithelial neoplasm in youth has been variously estimated at from 1 to 4 per cent of the entire incidence

of neoplastic disease. Williams from a study of 941 such neoplasms concludes that infancy and childhood are completely exempt from true cancer using the term in the sense of malignant epithelial neoplasm. He found only one patient under 20 years in a group of 806 with cancerous tumor. Later he collected 11,934 cases and found that 0.99 per cent of the patients were under 30 years of age. Gussow, by massing the statistics of several continental and English writers, obtained a total of 3,385 cases of which only two originated before the patients were 20 years of age. De la Camp in a careful search of the literature previous to 1897 found 9,963 cases of carcinoma and of these 19 occurred before the patients were 20 years of age. Biering reports 9 patients with carcinoma between 23 and 35 years, only one of whom was under 25 years, a patient with carcinoma of the cervix, and he concludes that carcinoma in early life is becoming more common as careful observation continues to reveal the occurrence of carcinoma in the earlier decades. Van Glasser of the pathological institute of the university of Erlangen found that 3.5 per cent of 527 cases of carcinoma observed at necropsy had occurred in patients who were under 30 years of age.

If Bereovitz' study of 131 patients operated on for cancer in which he found 50 per cent under 40 and 19 per cent under 25 could be considered authentic (there was no microscopic examination), it would seem that cancer occurs much earlier in life in China than in the western hemisphere.

GENERAL SURVEY OF CASES

Both gross and microscopic studies were made in each case in this series in which a specimen was removed at operation. There were only a few cases in which no specimen was taken. In the latter cases the disease was

¹Thesis submitted to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Surgery, May 1924.



Fig. 1. Carcinoma of the cecum with a benign polyp in a female aged sixteen years. Gross specimen (a) carcinoma (b) benign polyp (c) normal mucous membrane

so advanced and the diagnosis so evident that the diagnosis can be accepted without question.

Carcinoma and epithelioma in youth are found in practically every organ of the body. They are most frequent in the large intestine. In this series of 112 cases there were 65 females and 47 males the preponderance of females being due to the large number of tumors of the ovary, breast and cervix. As regards neoplasms in the extragenital organs the males and females were about equally divided. The youngest patient was one year of age and the oldest 25 years (arbitrarily taken as the limit) (Table I). The histories and findings of many of the patients not heard from as well as of those known to be alive 1 to 3 years after operation would indicate that many of the patients had died, thus raising the total mortality to much above 50 per cent.

Clinically this group of cases is characterized by a relatively short history, symptoms of moderate intensity but rapidly progressive, quite definite physical findings, moderate to marked loss in weight in most cases, very little anemia and a high mortality.

Epithelial neoplasms can be divided into two great groups, the adenocarcinomata or those derived from glandular or secretory epithelium, and the epitheliomata (epidermal

TABLE I—STATISTICS REGARDING ALL PATIENTS WITH EPITHELIAL NEOPLASMS OPERATED ON AT THE MAYO CLINIC BETWEEN JANUARY 1914 AND JANUARY 1924 (PATIENTS LESS THAN TWENTY SIX YEARS OF AGE)

	Number	Percentage
Total	112	100.0
Male	47	41.9
Female	65	58.1
Single	78	69.7
Married	34	30.3
Aged 1 to 10 years	9	8.0
Aged 11 to 20 years	21	18.7
Aged 21 to 26 years	82	73.3
Known dead	56	50.0
Living 1 to 3 years	19	17.1
Living more than 3 years	16	14.2
Not traced	21	18.7

carcinoma) or those derived from protective or covering epithelium.

CARCINOMA

Pathology. The gross appearance of carcinoma in the young varies somewhat in the different organs. In most cases the neoplasm is a large irregular fungating growth with overhanging edges often with superficial ulceration and superimposed infection. In other situations the thyroid gland and kidney, they present a more uniform homogeneous appearance on section, some hard and some soft depending on the amount of cellular tissue in proportion to the stroma present. In the ovary are solid or cystic carcinomata or sometimes both. Many of the tumors are large multilocular cystadenomata with small or large areas of papillary carcinoma either intracystic or extracystic or both.

Compared with sections of similar tumors in older persons the tumors in these cases give a microscopic picture of a more rapidly growing undifferentiated tissue often with many mitotic figures in each field.

In an endeavor to determine if possible some cause for the high mortality from carcinoma in the young I studied differentiation in my series. Hyalinization was never present. Lymphocytic infiltration and fibrosis were present to a moderate degree and only in the less malignant tumors. Cellular differentiation was present largely in cases of small



Fig 2 (left) Same case as Figure 1. Section through benign polyp. (X70)

Fig 3 Same case as Figure 1. Section through carcinoma. Note difference in malignant cells (a) and cells in Figure 2. (X10)

intracystic carcinomatous cystadenomata of the ovary and carcinomata of the thyroid. The mortality was comparatively low in both groups.

In this series, 89 patients under 26 years of age had carcinoma, the known mortality was 63.15 per cent.

Carcinoma of large intestine (including rectum). A comparatively large number of malignant epithelial tumors arise in the large intestine and the rectum during early life (Table II). Moreover, the earliest duly authenticated case of carcinoma of the large intestine in the literature which I have been able to find is that in a child of 7 years reported by Hines, previously mentioned. The number of individual cases of carcinoma of the large intestine in patients under 25 years is considerable. French observers, Baur and Bertem, have reported 9 cases in the cecum and 12 in the sigmoid, all fatal within 9 months from the onset of symptoms. Milne reported the case of a child of 12 who died 36 hours after the onset of symptoms of acute intestinal obstruction. Necropsy revealed an annular colloid carcinoma of the rectum. A similar case is reported by Allingbam, one at 15 years by Fowler, two at 16 years by De la Camp and Strong, two at 17 years by Schoening and Cripps, one of a man of 24 years with constipation and loss of weight for 3 months and an annular carcinoma of the ascending colon with metastasis, reported by Cumston who also quotes the 21 cases of carcinoma in youth from the literature.

In this series 21 of the neoplasms (18.7

TABLE II — ANATOMIC DISTRIBUTION OF CARCINOMATA IN EIGHTY-NINE CASES (PATIENTS LESS THAN TWENTY-SIX YEARS OF AGE)

	Number	Cases	Per cent
Large intestine	21	112	18.7
Ovary	14	112	12.5
Stomach	9	112	8.0
Thyroid		112	6.25
Breast	7	112	6.25
Kidney	7	112	6.25
Testicle	5	112	4.4
Miscellaneous	10	112	1.0
Total	89	112	19.35
Not traced	13	89	14.6
Traced	76	89	85.39
Dead	48	76	63.15
Living 1 to 3 years	14	76	18.42
Living more than 3 years	14	76	18.4

per cent) were situated in the large intestine, of which 14 (12.5 per cent) were in the rectum and rectosigmoid, 3 in the cecum, and 4 in the remaining portions of the colon (Table III). Ten were in males and 11 in females. Of the 21 patients 16 are dead, 2 are living 1 to 3 years, one is living more than 3 years, and 2 are not traced, giving a known mortality of 84.2 per cent for this group. Both of the patients not heard from are probably dead, for they had extensive malignant disease with metastasis at the time of operation. The patient who lived more than 3 years was in good health 6 years after operation. One of the patients who was alive 1 year after operation was losing weight and strength rapidly at that time.

In the cases of carcinoma of the rectum and rectosigmoid only the mortality was even worse. Of the 14 patients with carcinoma of the rectum, 12 are dead, one is living 9 months



Fig. 4

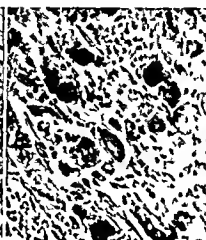


Fig. 5



Fig. 6

Fig. 4 Solid carcinoma of right ovary in a girl 8 years of age. Metastasi to inguinal glands. ($\times 60$)

Fig. 5 Colloid carcinoma of the stomach in a girl aged 24 years. Low power view shows cords of cells in fibrous stroma. moderate tendency toward glandular formation.

Other portions of the field show definite colloid degeneration. ($\times 150$)

Fig. 6 High power view of carcinoma of the stomach to show highly malignant, undifferentiated cells with mitotic figures. ($\times 400$)

after operation but is fast losing ground and one had not been heard from making a mortality of 85.7 per cent and not one patient was known to be living more than 1 year after operation.

The youngest patient was 16 years old and the oldest 25. The average time from the onset of symptoms to operation was 10.6 months. The average time from the onset of symptoms to death was 2 years and 1 month.

TABLE III—TWENTY-ONE PATIENTS WITH CARCINOMA OF THE LARGE INTESTINE (PATIENTS LESS THAN TWENTY-SIX YEARS OF AGE)

	N	C	P	Per cent
Lesion in rectum	14	112	12	5
Lesion in caecum	3	112	2	6
Lesion in remainder of colon	4	112	3	5
Total in large intestine	21	112	18	7
Patients not traced	2	21	9	5
Patients traced	19	21	90	47
Patients dead	16	19	84	21
Patients living 1 to 3 years	2	19	10	52
Patients living 3 years plus	1	19	5	26
Resection	9	21	43	0
Colostomy (palliative)	8	21	38	1
Exploration only	4	21	19	0
Distant metastasis	11	21	52	4

The family history was positive for malignant disease in 4 (20 per cent) of the 21 cases. The great majority of the patients came to the clinic complaining of one or more of the follow-

ing symptoms: abdominal pain, passing of blood, mucus and pus by rectum, diarrhoea or constipation, sense of obstruction, pressure of a mass, loss of from 5 to 60 pounds in weight and marked anemia. In comparison with similar cases in adult life these symptoms were more definite and of greater intensity. The passage of blood by rectum was the prominent symptom in the lesions of the rectum while the early appearance of a palpable abdominal mass was a very striking feature of the whole group.

The anemia was much more marked with the lesions of the colon proper, the average hemoglobin being 45 per cent as compared with 69 per cent when the lesion was in the rectum.

Nine resections of some type were performed. In 8 cases a palliative colostomy for obstruction was performed and in 4 cases the abdomen was closed after exploration.

In 11 cases (50 per cent) metastatic lesions were found in the liver or distant lymph nodes at the time of operation. Sixty-four and four tenths per cent of these carcinomata of the large intestine showed involvement of the neighboring lymph nodes. One hundred per cent of those patients with invasion of the lymph nodes are dead, while of those in whom the nodes were unaffected only 60

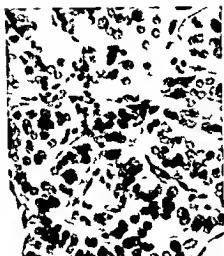


Fig. 1



Fig. 8

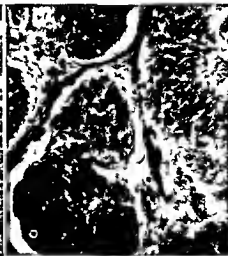


Fig. 9

Fig. 1 Early carcinoma in a degenerating adenoma the cells showing considerable differentiation in a woman aged 5 years who had had goiter for 12 years

Fig. 8 Low power view of a more malignant carcinoma with irregular groups of cells in a woman aged 20 years

with a goiter which had grown gradually for a period of 7 years ($\times 100$)

Fig. 9 Large neuroblastoma weighing 3,650 grams encircling upper pole of left kidney in a man aged 25. The epithelial structure resembles nerve tissue ($\times 200$)

per cent are dead. The average length of postoperative life with or without involvement of the nodes was 20 months, with involvement of the nodes 17.2 months, and without such involvement, 24 months.

All patients with rectal carcinoma are dead, whether or not lymph nodes were affected. Also the two patients with rectal lesions without involvement of the nodes had a much shorter postoperative life than the remainder of the group. It cannot be said, therefore, that the presence or absence of involvement of the lymph nodes in rectal carcinoma in the young is of any prognostic value as far as recovery is concerned. However, a higher percentage of involvement of lymph nodes is found and the average postoperative life is shorter (16.7 months) than in similar cases in the adult.

In two cases the neoplasm was associated with a benign polyp. In one of these (Figs. 1, 2 and 3) the carcinoma apparently originated from the base of the polyp for the polyp arose near the center of the neoplasm. Sections, however (Fig. 2) showed the polyp to be benign. No regional lymph nodes were involved and the patient is living and well 1 year after operation.

Colloid carcinoma occurred in 3 cases in this series, one each in the rectum, transverse colon, and caecum. Hayes found that colloid growths occurred in 16 per cent of cancers of the large

bowel in adults. This series showed them in very nearly the same proportion, 14.3 per cent in youth. He also encountered a high percentage of local involvement of the lymph nodes. In 2 of these 3 cases the neighboring lymph nodes were involved. The average age of these patients was 20 years, there was 100 per cent mortality. Preoperative symptoms lasted an average of 5.3 months, the average postoperative life was 14.3 months.

TABLE IV.—FOURTEEN PATIENTS WITH CARCINOMA OF THE OVARY (PATIENTS LESS THAN TWENTY SIX YEARS OF AGE)

	No.	Cases	Per cent	Remarks
Total	14	112	12.5	Both had general carcinomatosis at time of operation. One had definite metastasis to chest 2 months after operation.
Not traced	2	14	14.28	
Traced	12	14	85.71	
Dead	3	12	25.0	
Living 1 to 3 years	3	12	25.0	
Living more than 3 years	6	12	50.0	One had metastasis 5.5 years after operation.
Solid carcinoma	5	14	35.7	Mortality 60 per cent of 5 cases.
Cystic carcinoma	9	14	64.3	No mortality, one had metastasis.

Carcinoma of the ovary. Carcinoma of the ovary in youth occurs chiefly in two forms, a solid and a cystic, but the two may be com-

bined. In this series there were 14 cases of carcinoma of the ovary (Table 4). The youngest patient was 8 years of age. This patient (Fig. 4) had a solid carcinoma of the right ovary with metastasis to the inguinal lymph nodes. She died 3 months after operation. This is similar to a case reported by M. Paz Mendoza of a child 5 years of age with a papillary carcinoma of the ovary and generalized metastasis. Various other individual cases of carcinoma of the ovary in youth have been reported in the literature.

These patients all came to the clinic with a history of gradual enlargement of the abdomen of from 3 weeks to 9 months duration with a moderate amount of pain. In only 3 cases was there any menstrual disturbance. Examination revealed a large pelvic tumor sometimes nodular and fixed on palpation, at other times cystic and freely movable. Laparotomy revealed large pelvic tumors from 15 to 45 centimeters in diameter, the largest weighing 31 pounds. Two patients had ascites and one a loose mucoid material throughout the abdominal cavity. One patient had a carcinoma involving the left ovary, uterus and tube.

Pathologically, these tumors are divided into solid carcinomata and cystic carcinomata.

Solid carcinoma of the ovary may be one large hard nodular mass, yellowish white on cut section or it may be a large multilocular cystadenoma with areas of solid carcinoma. Histologically it is composed of solid masses or cords of closely packed cells with large oval or round nuclei and very little fibrous tissue stroma (Fig. 4). There were 5 cases of solid carcinoma in this group; 3 of the patients (60 per cent) are dead, one had metastasis to the chest 2 months after operation and is probably dead and one has not been traced.

Cystic carcinomata of the ovary are large multilocular cystadenomata. They have a thick, fibrous capsule surrounding multiple small cysts containing a mucoid material. The normal cyst walls are lined with high columnar epithelium while other areas show papillary carcinomatous tissue either intra-cystic or extracystic or both. Although there were 9 cases of cystic carcinoma without a death, such carcinomata are potentially malignant since, if they are not removed before

implantation takes place throughout the peritoneal cavity, they may metastasize and cause death.

Carcinoma of the stomach. The incidence of gastric carcinoma in youth has been variously estimated at from 2 to 4 per cent of all gastric carcinoma. In a series of 2,038 cases of cancer of the stomach, Welch found 2.8 per cent in patients under 30. Osler and McRae report 4 per cent in 150 cases in their series. Smithies reports 16 cases (2.2 per cent) in patients under 31 years in a study of 721 pathologically demonstrated cases.

From January 1914 to January, 1924, 9 patients under 26 years of age in whom gastric carcinoma was demonstrated microscopically (Table V) were operated on at the Mayo Clinic. Of these 4 were female and 5 male. The youngest was 18 years of age, the oldest 25. Seven (77.7 per cent) of these patients are dead. One was alive 1 year after operation but had general metastasis at that time and one is alive and well 5 years after operation.

Clinically these patients all give a fairly good history of peptic ulcer of from 2 months to 4 years duration characterized by epigastric distress from 1 to 2 hours after meals, nausea and vomiting and loss of strength.

The anemia was slight in the 9 cases. There was achylia in two. Seven (77.7 per cent) were inoperable so far as resection was concerned, although exploratory operations were performed and specimens removed for diagnosis. In 8 cases (88.8 per cent) the lymph nodes, either along the lesser curvature or in distant parts of the body, showed carcinoma on microscopic examination.

The histological picture is that of a rapidly growing adenocarcinoma, the cells in some parts retaining their glandular arrangement.

TABLE V.—MORTALITY FROM GASTRIC CARCINOMA IN NINE PATIENTS (PATIENTS LESS THAN TWENTY SIX YEARS OF AGE)

	N	Cases	Per cent	Risks
Total	9	112	80	
Dead	7	9	77.78	
Alive 1 year	1		11.11	General metastasis
Alive 5 years	1		11.11	No involvement of lymph nodes
Inoperable at time of exploration	7		77.7	
			77.7	Within 6 months of operation



Fig 10



Fig 11

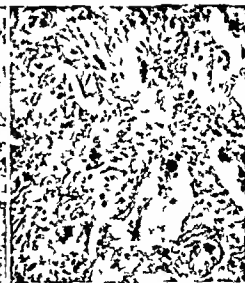


Fig 12

Fig 10 Photomicrograph showing section of specimen from carcinoma of the right kidney in a child 3 years of age. Masses of epithelial cells in different degrees of differentiation (X, 60)

Fig 11 Squamous cell epithelioma of lip grade (a) Epithelial pearls (differentiation)

Fig 12 Squamous cell epithelioma of cervix grade 3 in woman aged 24 showing very little differentiation (X120)

in others forming long cords or solid groups of undifferentiated cells (Figs 5 and 6)

This pathological appearance is borne out by the fact that death occurred within 6 months of the date of operation in all cases. This is an earlier and higher mortality than Smithies reported, 9 of the patients died within one and one fourth years, while 7 lived from 2 to 5 years or longer.

Carcinoma of the thyroid Malignant disease of the thyroid in youth is apparently an unexplored field. The incidence is practically unknown. This is probably simply a part of the paucity of accurate information and correct diagnosis of malignant disease of the thyroid in general, as brought out by Wilson, Mueller and Speese find the greatest incidence in the sixth decade, and Wilson in the fifth decade.

This, however, does not preclude the possibility of many carcinomata originating in youth, for it is generally admitted that malignant disease (or at least potentially malignant conditions) of the thyroid may be present for years, enclosed in an adenoma, and not become manifest until it has perforated the capsule and begun to involve the surrounding structures, producing symptoms of pressure on the larynx, trachea, oesophagus, or recurrent laryngeal nerves. If they are removed before reaching the latter stage, the patient can be cured.

These statements are corroborated by the findings in the present series of 7 cases of carcinoma of the thyroid in patients under 26 years of age. The youngest patient was 16 years old, and the average age 21 years.

There are no known deaths, 4 (66.66 per cent) are alive from 1 to 3 years, 2 (33.33 per cent) are alive more than 3 years, and one has not been traced (Table 6). This low mortality is explained by the fact that 6 (85.7 per cent) of the 7 patients came to the clinic with symptoms and signs of benign, nodular, non-toxic adenomatous goiters, and no suspicion of malignancy was entertained when operation was advised. The carcinoma was found by the pathologist and in each case was localized in one or more adenomata and was still intracapsular. According to the histories, goiter had been present from 1 to 11 years, an average of 6 years and 9 months. In only 2 (28.6

TABLE VI—SEVEN PATIENTS WITH CARCINOMA OF THE THYROID (PATIENTS LESS THAN TWENTY SIX YEARS OF AGE)

	No.	Cases	Per cent
Total	7	112	6.25
Female	4	7	57.1
Male	3	7	42.9
Not traced	1	7	14.2
Traced	6	7	85.71
Dead	0	0	
Alive 1 to 3 years	4	6	66.66
Alive more than 3 years	2	6	33.33

per cent) was there a history of recent rapid growth in the others there had been gradual steady enlargement for 2 or more years.

The only case of carcinoma of the thyroid in youth which I have been able to find in the literature is that of a Chinese boy aged 17 years reported by Velenky. This patient gave a similar history, that is of gradual nodular enlargement of the neck for 6 years. Obstructive dyspnea and hoarseness were present. A lymph node from the posterior triangle and the thyroid both showed the histological picture of carcinoma of the thyroid.

Carcinoma in young patients are usually still encapsulated within the adenoma presenting on cut section a softer pink or yellowish appearance than the remainder of the gland. The microscopic picture varies from that of the proliferating fetal adenoma with its solid cords of cells with large clear nuclei (Fig 7) to that of the medullary carcinoma with its more deeply staining irregular undifferentiated diffusely arranged cells often with mitotic figures in many fields (Fig 8).

Carcinoma of the breast The incidence of carcinoma of the breast in youth varies in the literature. Williams youngest patient in 500 consecutive cases was 24. Of 1622 patients with mammary cancer tabulated by Gross the youngest was 21 years. Cumston quotes 25 cases in patients under 30 years reported by Bryant, 19 cases by Birkett and 5 scattered cases from the literature. Blodgett, Bryan and Fowler report cases in patients aged 12, 14 and 20 years respectively.

Carcinoma of the breast occurred in 7 cases in this series, 4 of the patients are dead, one is alive less than 3 years since treatment, one living more than 3 years and one patient was not heard from (Table VII). The patients

TABLE VII - CARCINOMA OF THE BREAST (14 PATIENTS LESS THAN TWENTY SIX YEARS OF AGE)

	N	14	1	1	1	1
	14	1	1	1	1	1
Total	7	1	100	6	25	
Female	7	1	100	6	25	
Not Traced	6	1	14	25	1	Present
Trace	1	1	45	1	1	
Dead	4	1	60	60	1	Ext. ext.
Alive (1) 3 years	1	1	1	1	1	Ext. ext.
Alive more than 3 years	1	1	10	66	1	Absent

were all females. The youngest was 17 and the oldest 25. Seventy per cent of the patients had noticed a small lump in the breast for about 3 months.

Glandular involvement was demonstrated microscopically in 5 of the 7 cases, 4 of the patients are dead and the other patient was not traced. Neither patient living showed any glandular involvement indicating its prognostic value in carcinoma of the breast in youth as in adult life.

Carcinoma of the kidney Pure epithelial tumors of the kidney are rare in youth. In spite of voluminous writings and extensive classifications the origin and pathogenesis of renal tumors are still unsettled. Recently the view has been gaining ground that the so called hypernephroma of Grawitz is of nephrogenic origin and therefore a carcinoma and not a benign neoplasm of the adrenal. It occurs occasionally in youth. Undoubtedly some of the cases originally classed as mixed tumors of Wilms because of the age of the patients are really cases of epithelial tumor. Of 170 cases of renal neoplasm in childhood Albarran found 4 of adenoma, 7 of carcinoma, 2 of adenocarcinoma and 4 of adrenal tumor. Cumston reports 3 cases taken from the literature. Dehfeld, one case in a child 3 years of age. Jacobs, a large carcinoma of the left kidney with metastasis to the liver found in a stillborn premature infant.

In this series there are 6 cases of carcinoma of the kidney and 1 case of a large retroperitoneal tumor encircling the upper pole of the left kidney but not involving the renal tissue. This presented a histological picture of an epithelial tumor resembling a neuroblastoma (Fig 9).

Of the 6 patients with pure carcinoma of the kidney, 4 are dead, 1 is alive more than 3 years since treatment and one has not been traced. The youngest was 20 months and the oldest 25 years. Most of the patients give a history of urinary disturbance and of a predominant mass of a few months duration. The one patient still living had a very small tumor 3 millimeters in diameter in the cortex which was histologically similar to carcinoma.

Grossly the tumors were irregular and nodular, sometimes localized at one pole at

other times invading and destroying almost all of the renal substance, and often showing hemorrhagic degenerating areas. Microscopically, the picture varied from cords of cells with large clear nuclei regularly arranged through the more malignant appearing cells but still with a tendency toward glandular formation, to the diffuse cellular tissue showing no differentiation (Fig 10)

Carcinoma of the testicle Carcinoma of the testicle occurred in only 5 cases in this series. This relatively small number is due to the great frequency of heterotopic structures in the testicle, and although malignant tumors as a whole are probably more frequent in the testicle than in any other organ in the body in youth, pure carcinomata are relatively rare. Most of the tumors contained a mixture of

TABLE VIII—CARCINOMA OF THE TESTICLE IN THE YOUNG

	No	Cases	Per cent
Total	5	112	4.4
Dead	4	5	80.0
Alive 3 to 5 years	1	5	20.0
Metastasis	3	5	60.0
History of injury	3	5	60.0

TABLE X—NINETEEN MISCELLANEOUS CASES OF CARCINOMA (PATIENTS LESS THAN TWENTY-SIX YEARS OF AGE)

	No	Cases	Per cent
Total	19	112	17.0
Female	10	19	53.1
Male	9	10	40.9
Not traced	6	19	31.57
Traced	13	19	68.42
Dead	9	13	69.23
Alive 1 to 3 years	2	13	15.38
Alive more than 3 years	2	13	15.38
Average age 18.6 years			

TABLE IX—MISCELLANEOUS CARCINOMATA PATIENTS LESS THAN TWENTY-SIX YEARS OF AGE

	Age	Sex	Site of tumor	Pathological report	Result
1	23	M	Right cerebellar pontine angle	Metastatic gland. Carcinoma of neck	Died 1 year after operation
2	1	M	Subcutaneous tissue of back	Neuroblastoma	Died 5 months after operation
3	21	F	Lower jaw	Adamantinoma	Well 7 years after operation
4	9	F	Pituitary gland	Carcinoma	Died 7 months after operation
5	23	F	Bladder after operation	Papillary carcinoma	Died 3 years after operation
6	24	F	Upper abdomen	Carcinoma probably from pancreas	Living 5 months after operation
7	23	M	Upper abdomen	Primary carcinoma of liver with metastases to lymph nodes peritoneum and lungs	Died 48 hours after operation
8	21	F	Abdomen multiple. Lymph nodes in groin	Carcinoma	Not heard from. Multiple papillary carcinomatous cystadenoma with metastasis found previously
9	4	F	Right abdomen	Carcinoma	Not traced
10	23	M	Liver	Carcinoma	Cholecystoduodenostomy. Well for 3 years and then died from extension of lesion
11	16	M	Left side of abdomen	Colloid carcinoma	Died 7 months after operation
12	24	F	Pelvic tissues	Colloid carcinoma	Failing rapidly 9 months after operation
13	7	M	Pelvic tissues	Carcinoma	Not traced
14	25	F	Ovary	Simple ovarian cyst carcinomatous cystadenoma of mesogonad and meso-appendix	Living 4 years after operation
15	23	F	Left mastoid	Carcinoma	Recurred four times in 5 years. Necropsy showed metastatic carcinoma in pleura, lungs, thyroid and kidney
16	24	M	Right cheek	Carcinoma of sebaceous gland	Not traced
17	21	M	Lymph node at angle of jaw	Carcinoma	Died 5 months after operation
18	16	F	Nasopharynx and cervical lymph nodes	Carcinoma	Not traced
19	25	M	Lymph nodes (general)	Carcinoma	Not traced

sarcomatous and carcinomatous elements, considered of epithelial origin by some authorities. However, only purely epithelial tumors have been included in this series.

The literature is very inaccurate on this subject, with few pathologically demonstrated cases. Cumston quotes 51 cases reported by Ludlow and Lebert in which 5 of the patients were less than 5 years old, one was 15, and 11 were between 20 and 30.

In the present series of 5 cases, 4 of the patients are dead (all within 8 months after operation) and one patient is living and well 3 1/2 years after operation (Table VIII). There was a history of injury in 3 cases. In all cases there was a round hard, nontranslucent tumor of the testicle, and in 3 there were palpable metastatic tumors in the retroperitoneal lymph nodes at the time of operation.

Microscopically these tumors were composed of interlacing strands of large epithelioid cells, in some areas tending toward alveolar arrangement and supported by a relatively acellular stroma. The cells resembled normal interstitial elements, indicating their supposed origin. The nuclei were of moderate size, vesicular round and contained one or more nucleoli.

Miscellaneous cases of carcinoma. This group includes 19 cases of carcinoma in different regions throughout the body. Table IX gives a synopsis of the cases and Table X the percentages and mortality which will be found to be in accord with the groups of cases of carcinoma previously discussed.

EPITHELIOMA

Williams states that the uterus (with which the cervix is probably included) is very seldom attacked in youth. He quotes 24 cases of carcinoma (probably epithelioma) of the vagina 2 of which reported by Kuestner, were in patients less than 20 years old and 1, a case of epithelioma of the introitus in a child aged 3 1/2 years, reported by Lebert. Cumston and Biering report cases of epithelioma of the cervix in women aged 28 years and 23 years, respectively, both confirmed by microscopic examination. The latter also presented two cases of squamous cell epithelioma of the eyelid and side of the face in patients aged 28 and 32 years, respectively. Grant reports a

squamous cell epithelioma of the mouth and palate in a boy aged 17 years, which was removed, but recurred and killed the patient. Roth reports 3 cases at 11, 18, and 21 years, involving the lower lip, buttocks, and tongue, and suggests that the patients belong to so called "cancer families."

There were 23 cases of epithelioma in patients under 26 years of age in this series, 11 patients were males and 12 females, the youngest was 19 years of age. In nearly half of the cases the neoplasm was situated in the cervix and lip (5 cases in each Table XI). There were 17 squamous cell and 5 melanotic epitheliomata, and one nonmelanotic melanotic epithelioma (Table XII). Eight of the patients are dead, 5 are living from 1 to 3 years after operation, 2 living more than 3 years and 8 have not been traced (Table XIII).

TABLE XI—ANATOMICAL SITUATION OF EPITHELIOMA IN TWENTY THREE PATIENTS

Location	N
Cervix	5
Lip	5
Leg	3
Neck	2
Skin over sternum	2
Nose and cheek	1
Left antrum	1
Arm	1
Nasopharynx	1
Jaw	1
penis	1
Total	23

TABLE XII—CLASSIFICATION OF EPITHELIOMATA IN TWENTY THREE PATIENTS (PATIENTS LESS THAN TWENTY SIX YEARS OF AGE)

Cases	Grade 1	Grade 2	Grade 3	Grade 4	Total
Squamous-cell epithelioma	2	4	4	7	17
Melanotic epithelioma				5	5
Nonmelanotic melanotic epithelioma				1	1
Total	2	4	4	13	23

Squamous cell epithelioma. Nearly half (7 cases) of the squamous cell tumors were grade 4 (Table XII). Six (40 per cent) of these seventeen patients with squamous cell epithelioma are dead. There were no deaths among the patients with epithelioma of grades 1 and 2 (Table XIV). Of those with epithelioma of grade 3, 2 died. Of those with epithelioma of grade 4, 4 died. These figures demonstrate

that the high mortality due to squamous cell epithelioma of grades 3 and 4 in adults, as shown by Broders, is also found in youth.

The patients with neoplasms of grades 1 and 2 gave long histories of slowly growing lesions and the pathological pictures were those of relatively benign lesions (Fig 11), while the patients whose neoplasms were of grades 3 and 4 had symptoms of shorter duration, more extensive lesions and a gross and histological picture of malignancy (Fig 12).

Epithelioma of the cervix The cervix was involved in 5 cases in this series, 3 of the patients are known to be dead and the other 2 were not heard from more than 1 year after operation. Four were married and 1 was single. There was only one childbirth in the group. The cervix was large, soft, red, and easily bleeding. Pathologically these cases fall into the most malignant groups, three of the neoplasms were in grade 3 and two in grade 4, presenting microscopic pictures of solid masses or cords of undifferentiated epithelial cells (Fig 12).

Epithelioma of the lip The youngest patient with squamous-cell epithelioma of the lip mentioned in the literature was a boy aged 14 years. His case was reported by Stephen. The tumor had appeared 2 years before and recurred as a large, hard fungating cancer with metastasis to neighboring lymph nodes. In my series, squamous-cell epithelioma involved the lip in 5 cases. Clinically and pathologically these fall naturally into two groups.

TABLE XIII—TOTAL MORTALITY IN TWENTY-THREE CASES OF EPITHELIOMA

	No.	Cases	Per cent
Total	23	112	75.53
Not traced	8	23	34.78
Traced	15	23	65.21
Dead	8	15	53.33
Alive 1 to 3 years	5	15	33.33
Alive more than 3 years	2	15	13.33

TABLE XIV—MORTALITY OF EPITHELIOMATA BY GRADES AND TYPES

	Number
Grade 1 squamous-cell epithelioma	0
Grade 2 squamous-cell epithelioma	0
Grade 3 squamous-cell epithelioma	(3 traced) 4
Grade 4 squamous-cell epithelioma	(5 traced) 6
Total	(12 traced) 10
Squamous-cell epithelioma of cervix	(4 traced) 3
Squamous-cell epithelioma of lip	(4 traced) 1
Melanotic epithelioma	(1 traced) 1
Nonmelanotic melano-epithelioma	(1 traced) 1

In 3 cases, characterized by a history of a chronic ulcer of the lip of several years' duration and recovery in all cases after operation, the primary lesion was a grade 2 squamous cell epithelioma without involvement of the submaxillary and submental lymph nodes (Fig 11).

In the other two cases there was a shorter history, in both there was a grade 4 squamous-cell epithelioma of the lip with metastasis into one or more groups of lymph nodes. One of these patients is dead and the other could not be traced. All 5 patients in this group were males. In the remaining (7) cases the squamous-cell tumors were scattered over different areas and presented similar characteristics.

Melanotic epithelioma The melanotic epitheliomata in this series were all situated on the skin of the extremities. In 4 of the 5 cases metastasis was present at the time of operation. Unfortunately only one case could be traced, but with this large percentage of early metastasis there can be little doubt of the ultimate mortality.

SUMMARY

One hundred twelve patients less than twenty six years of age, with pathologically demonstrated carcinoma and epithelioma, operated on at the Mayo Clinic between January, 1914, and January, 1922, were studied.

Carcinoma is much more common in youth than is generally recognized.

Heredity is considered to be the greatest etiological factor in carcinoma in the young.

In this series, there were 89 cases of carcinoma and 23 of epithelioma. Only purely epithelial tumors have been included. The youngest patient was 1 year of age.

The total known mortality was more than 50 per cent (18.7 per cent could not be traced). Only 14.2 per cent are alive more than 3 years after operation.

The pathology of the neoplasms varied in the different organs. The cells showed different degrees of differentiation. The large undifferentiated cells with large oval or round nuclei and deeply staining nucleoli (one-eyed cells) predominated.

The lack of hyalinization, fibrosis, lymphocytic infiltration, and cellular differentiation may have been responsible for the increased malignancy of these neoplasms in the young.

Nearly every organ in the body has been the seat of carcinoma in the young. The rectum and ovary were most frequently involved (14 cases each 12.5 per cent), carcinoma of the rectum had the highest known mortality (85.7 per cent), with no patient known to be living longer than one year. The other organs were involved as follows: stomach in 9 cases (8 per cent), thyroid, breast, kidney, each in 7 cases (each 6.25 per cent), testicle, lip, cervix, each in 5 cases (each 4.4 per cent) miscellaneous, in 39 cases (34.8 per cent).

Anaemia is a feature of carcinoma of the right half of the colon in youth as in adult life.

Involvement of the neighboring lymph nodes in carcinoma of the breast and large intestine in youth reduces postoperative life and increases the ultimate mortality.

In youth carcinoma in the thyroid is usually found by the pathologist and not by the surgeon. It is intracapsular and its mortality is low.

Broders' classification and grading of epitheliomata is applicable in youth as well as in adult life. Seventy-two and six tenths per cent of epitheliomata in youth occur in the more malignant groups (grades 3 and 4).

BIBLIOGRAPHY

- 1 ALBERHAN Quoted by Cuming
- 2 ALLINGHAM A Diseases of the Rectum 3d ed Philadelphia Lindsay 1879 264-307
- 3 BARTHELOW ROBERTS Carcinoma of the stomach New York M J 1879 xxx 337-347
- 4 BALR J and BERTEN L Le cancer du gros intestin chez les jeunes sujets Arch gén de chir 1914 viii 675-695
- 5 BERCOVITZ NATHANIEL Cancer in Hainan China J Cancer Res 1919 iv 229-234
- 6 BIKKETT Holmes System of Surgery Quoted by Cuming
- 7 BLODGETT A N Carcinoma in the breast in a child Boston M & S J 1897 cxlvi 611
- 8 BRYAN R C Cancer of the breast in a boy fifteen years old Surg Gynec & Obst 1914 xviii 545
- 9 BRYANT Quoted by Cuming
- 10 CLARK J G Carcinoma developing from dermoid cysts Prog Med 1899 ii 150-169
- 11 CRIPPS H Supposed cancer of the rectum in a boy aged nineteen Lancet 1884 ii 1030
- 12 CUMSTON C G Carcinoma under the age of thirty Boston M & S J 1899 cxli 435-436
- 13 DE LA CAMP Carcinoma in den ersten beiden Lebens decennien. Zentralbl f allg Path u path Anat 1899 viii 108-109
- 14 DELAFIELD FRANCIS Cancer of the kidney in a child three years of age New York M J 1879 xxx 304
- 15 EWING JAMES Neoplastic Diseases Philadelphia W B Saunders & Co 1919 74-784
- 16 FOWLER R H Carcinoma in the young report of cases Med Rec 1915 lxxvii 730-732
- 17 GARDNER S J and CURRIE W T Prostatic carcinoma in youth California State J M 1914 xii 279-280
- 18 GRANT P N Epithelioma of the mouth in a young person Brit M J 1919 ii 775-776
- 19 GROSS Quoted by Cuming
- 20 GUSSELOW A Aetiologie des Carcinoma uteri Deutsch Chir 1886 lvi 211
- 21 HAUPT LAUL Early references to cancer J Am M Ass 1921 lxxvii 1440
- 22 HAYES J M The involvement of the lymph glands in carcinoma of the large intestine Minnesota Med 1921 iv 653-663
- 23 HIVES H H Adenocarcinoma in a child aged seven years Lancet Clinic 1910 civ 442-443
- 24 HOOD A J and ALBERT H An unusual mixed tumor (adenosarcoma) of the kidney in a young child California State J M 1923 xii 281
- 25 JACOBI A Congenital carcinoma of the kidney and liver Am J Obst 1886 xiii 119-122
- 26 KUESTNER O Ueber den primären Scheidenkrebs Arch f Gynaek 1876 ix 279-290
- 27 LANGHANS T Epitheliale Formen der malignen Struma Arch f path Anat 1907 cxviii 69-188
- 28 LUDLOW and LEBERT Quoted by Cuming
- 29 MCCARTY W C and MACCOW J A H Malignant neoplasia of the kidney occurring in infancy Surg Gynec & Obst 1923 lxxvii 781-786
- 30 MARSHALL JOHN The Morton lecture on cancer and cancerous diseases Brit M J 1889 ii 1141-1145
- 31 MELENTE F L A metastasizing malignant tumor of the thyroid gland Ann Surg 1922 lxxvi 684-694
- 32 MENDOZA GUAYON M P Capillary carcinoma in an infant J Philippine Islands M Ass 1922 ii 169
- 33 MILNE J A Colloid carcinoma at twelve years of age Brit M J 1903 ii 923-926
- 34 MUELLER G I and SEZESE J Malignant diseases of the thyroid gland University Pennsylvania M Bull 1906-1907 xix 74-88
- 35 OSLER W and MCCRAE T Principles and Practice of Medicine New York Appleton 1920 489-496
- 36 PAGET J The Morton lecture on cancer and cancerous diseases Brit M J 1887 ii 1091-1094
- 37 PARIKH DUNCAN Colloid carcinoma Ann Surg 1923 lxxvii 90-105
- 38 ROTH Carcinoma in the young Ztschr f Krebsforsch 1923 xii 115-210
- 39 SCHONING G Ueber des Vorkommen des Mastdarmkrebses in den ersten beiden Lebensdecennien Deutsche Ztschr f Chir 1885, xvi 36-51
- 40 SMITHIES FRANK Gastric cancer in the young J Am M Ass 1914 lvi, 1839-1844
- 41 STEPHEN L I Epithelioma of the upper lip in a boy fourteen years of age Indian M Gaz 1904 iv 220
- 42 STERN CARL Malignant neoplasms in children Deutsche med Wchschr 1892 xviii 404-499
- 43 STROM L W Embryonal carcinoma of the ovary carcinoma of the rectum in a boy sixteen years Proc New York Path Soc 1917 xvii 71-72
- 44 THEILHAUER A Cancer in old age Surg Gynec & Obst 1914 vi 650-656
- 45 VON GLASSEN Quoted by Cuming
- 46 WELER C V Age incidence in carcinoma Arch Int Med 1913 ix 539-545
- 47 WILLIAMS W R Malignant tumors of infancy childhood and youth Lancet 1897 i 1194-1196
- 48 WILLIAMS W R Malignant tumors of infancy childhood and youth Lancet 1893 ii 481-482
- 49 WILLIAMS W R Natural History of Cancer New York William Wood & Co 1903 317-331

CLINICAL SURGERY

FROM THE OBSTETRICAL CLINIC OF GLASGOW UNIVERSITY

CONSERVATIVE CÆSAREAN SECTION BY THE LOWER UTERINE SEGMENT INCISION

By J. M. MUNRO KERR, M.D. GLASGOW SCOTLAND
Professor of Obstetrics and Gynaecology Glasgow University and Royal Lying-in Hospital

AND
JAMES HENDRY, M.A. B.Sc. M.B.
Senior Assistant

DANGERS AND POSSIBLE COMPLICATIONS

THE dangers and possible complications of the lower uterine segment operation are few. While the bladder might appear to be in danger, it is really very safe. As the lower uterine segment becomes more and more stretched it rises above the bladder, there may be a depth of as much as 5 inches between the apex of the emptied bladder and the upper margin of the loose portion of the peritoneum covering the front of the uterus, which margin may be taken for practical purposes to indicate the upper border of the lower uterine segment. The uterine incision described in this article is made in a transverse direction, so that there is ample space in which to open the lower

uterine segment without even disturbing the bladder.

When the operation is performed too early in labor or when the head is exceptionally large there may be difficulty in securing sufficient breadth of the uterine incision for the delivery of the head. To avoid damage to the large vessels at the side of the uterus at this stage, the incision may with advantage be made in a curved form with the convexity directed downward.

PREPARATION OF THE PATIENT

The preparation of the patient for this operation is similar to that required for any abdominal operation and need not be detailed. It is very

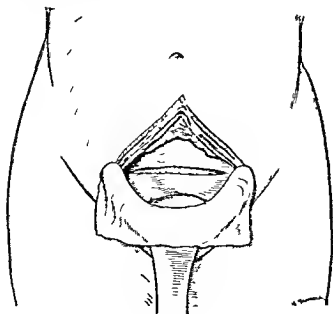


Fig. 1. Incision through loose peritoneal covering of uterus.

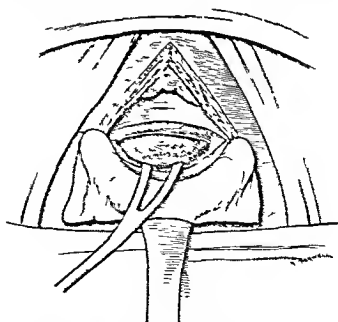


Fig. 2. The head may be poked up with short obstetric forceps which are used as guides, not tractors.

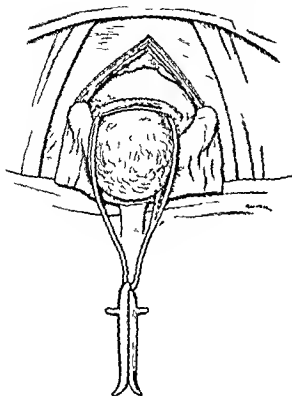


Fig. 3 Delivery is completed by pressure on the fundus

important that the bladder be thoroughly emptied by catheter just before the operation

TECHNICAL STEPS OF THE OPERATION

The patient is placed in the Trendelenburg position. One half cubic centimeter pituitrin is injected into the triceps muscle to secure prompt contraction when the uterus is emptied. A longitudinal incision about 6 inches in length is made through the abdominal wall in the middle line the lower end just reaching the symphysis pubis. The lower end of the wound is then retracted over a protecting layer of gauze with a Doyen's retractor. The rest of the abdominal cavity is protected by packing off the upper portion of the operation area with gauze. A transverse incision is made through the loose peritoneal covering of the uterus about half way down the lower uterine segment (Fig. 2). A curved incision as described is then made through the uterine wall in the same region. When the center of this incision is complete, a blunt pointed bistoury is employed to extend it in either direction to the required degree. If the head is not easily accessible pressure on the fundus through the abdominal wall often brings the occiput into the wound. To avoid handling

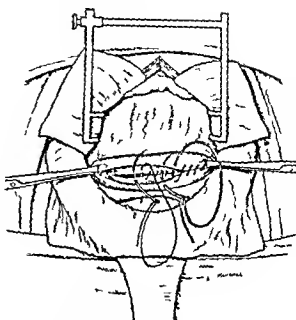


Fig. 4 Self retaining retractor has been inserted and suture of wound commenced

especially in presumably infected cases, the head may then be grasped with a pair of short obstetric forceps used as guides and not as tractors and the delivery completed by pressure on the fundus (Figs. 2 and 3). The umbilical cord is ligated and divided in the usual way. A self retaining retractor is now inserted to keep the sides of the abdominal wall apart (Fig. 4). If the cervix is not well dilated, the placenta is delivered by compression of the fundus through the abdominal wall, and traction on the cord. An intramuscular injection of a sterile preparation of ergot is given at this stage. If the cervix is known to be well dilated and this is a most important advantage in an infected case, the placental end of the cord is dropped back into the uterus, the placenta and membranes being expressed *per vias naturales* when the abdomen has been closed. By this means intra-uterine manipulations are reduced to a minimum. The edges of the uterine wound are now picked up with fine tissue forceps or temporary silk ligatures. The mucous membrane, with the innermost portion of the muscle coat is sutured with a continuous No. 1 chromic gut suture, the edges of the mucous membrane being directed inward toward the uterine cavity (Fig. 4). The remainder of the muscle coat is carefully approximated and sutured with a continuous No. 2 or No. 3 chromic gut suture (Fig. 4). Great care must be taken to secure completely the lateral extremities of the incision. The peritoneum over the uterus is closed with a

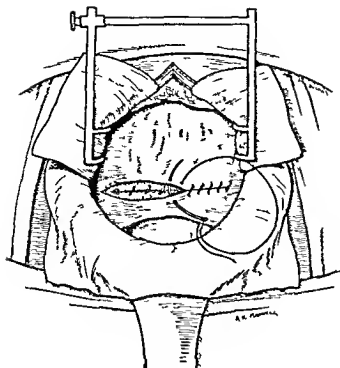


Fig 5 Suture of peritoneum over the uterus

continuous No. 1 or No. 0 catgut suture, the operation area being thus completely shut off (Fig. 5). The gauze packing is removed, and the abdominal wall carefully closed in layers. The surface of the wound is secured with an anchored dressing as shown in Figure 6.

POSTOPERATIVE CARE

No special postoperative treatment is employed. It is advisable to make sure that the bladder does not become overdilated. Special attention must be paid to the lowermost portion of the abdominal wound as the abdominal wall sometimes tends to lie in a fold just over the symphysis pubis, thus increasing the risk of wound infection. The patient is kept with the shoulders slightly raised so as to secure satisfactory drainage. The abdominal stitches are removed on the tenth day. The patient is generally allowed out of bed on the sixteenth day.

GENERAL REMARKS ON PROGNOSIS

The prognosis we have found to be very satisfactory, and the uterine scar, as evidenced by "repeat" operations, has proved sound in all cases except one, in which there was definite thinning at the right end of the scar. In most cases no trace of the scar could be found.

As will be observed, the uterine incision is a transverse one, which we think better than the longitudinal one very frequently employed. With the latter, there is a risk of the upper part of the

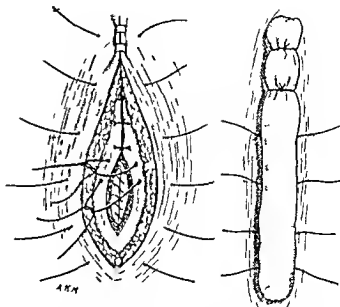


Fig. 6 Closure of abdominal wound. Method employed by author. Continuous catgut sutures for peritoneum; interrupted catgut for sheath; interrupted silk worm through whole thickness of wall except the peritoneum. Michel's clip for skin. Two silk worm sutures are shown tied over thin strip of gauze. This is the only dressing.

wound extending into the active contractile portion of the uterus, and this occurred definitely in four out of all the five cases recorded of subsequent rupture of a lower uterine segment scar. Those cases were recorded by Wolff, Franz, Freund and Baisch. The extension of the longitudinal incision downward has resulted in several cases of injury to the bladder.

Our reasons for believing that an absolutely sound uterine scar cannot be secured in the active contractile portion of the uterus may be stated as follows: (1) difficulty in securing complete asepsis, (2) the uterine muscle fibers during the puerperium are in a state of degeneration, (3) the sheets of muscle fiber which form the uterine wall, are irregularly distributed, so that it is impossible to coapt the muscle fibers exactly (in consequence, small pockets of blood collect, which in the process of healing are replaced by fibrous tissue), (4) The uterus is in a state of unrest during the early days of the puerperium, (5) the necessity imposed upon the surgeon of using his ligatures not only as coaptors, but as hæmostatic agents, (6) if the placenta is situated on the anterior wall, as occurs in 40 per cent of cases, the operator will find that satisfactory coaptation of the uterine surface of the wound is difficult to establish, because this surface is very friable and contains large sinuses.

Another great advantage of this operation over the classical one is that the operation area can be

completely closed over with peritoneum, and consequently postoperative adhesions are seldom found. In our experience the widespread adhesions after the classical operation form a very considerable operative difficulty, when a second caesarean section becomes necessary.

The following is a brief summary of results in a series of 107 cases:

Cases	Total	Maternal mortality	Percentage
Clean	82	0	0
Doubtful	25	4	16

In "clean" cases are included only those in which all pre-operative vaginal examinations were carried out in hospital; doubtful include all the others. The interference in the latter series varied from the previous unsuccessful application

of forceps under domestic conditions to unsupervised vaginal examinations by nurses or midwives in 12 of the series, including 2 of the fatal cases, not less than five such examinations had been made in each case.

SUBSEQUENT LABORS IN 26 OF THE ABOVE CASES

	Cases
Second caesarean section of the lower uterine segment type	17
Second caesarean section of the classical type	6
Spontaneous delivery of a smaller child	2
Low forceps	1

There were no maternal deaths in this series. In only one of the cases already referred to was any thinning of the scar found at the second operation, and that in a case in which the patient had been several hours in labor.

FROM THE SURGICAL CLINIC OF THE UNIVERSITY AT FRANKFURT AM MAIN

THE TECHNIQUE OF CARDIOLYSIS¹

BY PROFESSOR DR. VICTOR SCHMIEDLIN, FRANKFURT AM MAIN, GERMANY

THE object of cardiolysis is to relieve the heart from cicatricial adhesions of the pericardium and mediastinum, which inhibit its free action. Because of the chronic inflammatory changes in the pericardium, massive scar tissue is formed which often may be 1 centimeter thick, practically walling in the heart. The characteristic contraction of such cicatricial callus will gradually inhibit the activity of the heart muscle and may finally nearly completely smother the circulatory motor.

This diseased state has been given various names, such as *concretio pericardii*, *synclitron pericardii*, *symphysis cardiaca*, and *pericarditis chronica adhesiva*. We suggest because of its more general and uniform significance, the name *callous pericarditis*.

In certain cases, which however have not been numerous in our experience, simultaneous adhesions to the anterior chest wall were noted. These cases showed the well known signs of systolic retraction of the thorax, with respiratory inhibition of the chest, the Brondbent sign. This syndrome can be relieved by a removal of the bony thorax as carried out by Brauer. The freeing of the heart itself from the bonds of encircling and contracting scar tissue can be obtained only by a decortication of the heart, as suggested by Delorme, Beck, and L. Rehn, and performed first by Rehn.

DANGERS AND COMPLICATIONS

The operation of cardiolysis in the sense of a decortication of the heart has naturally its dangers and complications. As regards the plan of operation, our experience has shown that the question of where to start the decortication and how far to go with the freeing of the heart is important. The freeing of the heart muscle means adding considerable work to the heart. Furthermore it must be considered that we are not dealing with a normal heart muscle but with one that is damaged by chronic inflammatory changes and by trophic disturbances as a result of prolonged constriction. This is specially true of the right heart. As the right heart lies more anteriorly and is easy to free, the beginner may start with this part of the operation but this procedure involves great danger. The liberation of the right heart from its

scar covering may result in an overdistention of the muscle and valvular insufficiency. To understand the mechanism involved here we must remember that the normal circulation is maintained chiefly by the left heart. The right heart precedes the left side, which drains off any additional strain.

If now a uniform compression of the whole heart is present, the action of the left ventricle reduced to a minimum and the difference in pressure from the right to the left heart is missing, then a freeing of the right heart, with the left ventricle still bound down, will result in an overburdening of the right ventricle. The whole system loses the solid support of the callus, which the muscle fibers have been using as a means of resistance. The heart muscle which has been freed of its callus loses its support with its bonds, can not resist the additional burden and dilates. The tricuspid valves become insufficient, and the right heart throws the blood back into the great veins. Finally the diastolic dilatation cannot be compensated by a powerful systole and the overburdened ventricle becomes paralyzed. Insufficiency of the heart may occur suddenly during the operation and result in death, or it may develop gradually in the course of weeks and progress toward a complete paralysis of the circulation. In these cases a decortication of the right heart should under no circumstances be attempted, the scar should be left as a support of the right ventricle, and the decortication limited only to the left ventricle. In other cases the powerful left ventricle is able to resist the constriction to a great extent, the callus on the left side is decidedly less marked and the left heart is capable of fairly good action. Here the right ventricle may also be freed but only after a complete liberation of the left ventricle has taken place.

Degree and extent of scar formation and disturbances in the co-ordination of various parts of the heart can be estimated to a certain degree before operation. When the heart action on the left side is just slightly impaired there is nothing more than a damming back of the inflow on the right side, as stated by Volhard. Careful roentgenological observation of the heart will show the heart contour absolutely rigid and motionless on the right and the superior vena cava as a broad

¹Translated from the German by C. d. Takat, M.D.

ened band due to the back flow. The left side still shows good motion. If the incarceration of the left heart has progressed to a greater extent clinical symptoms of a left sided inhibition of inflow will prevail. Great air hunger, edema of the lung and bilateral hydrothorax which can hardly be checked by pleural puncture will be found. In such cases the X ray will show weak excursions of the left heart also.

Each individual case then requires a special diagnosis on which the plan of operation will be founded.

LIBERATION OF THE LEFT VENTRICLE

Most important is the complete liberation of the left ventricle. In many cases this is the only surgical measure necessary. It should always precede the freeing of the right ventricle. A decortication of the auricles should never be attempted.

Even if the menacing danger to the work of the heart is avoided by adapting the operation to the individual case, a further point of danger lies in the technique of the removal of the scar. Aside from the adhesions in the mediastinum, the scar tissue coat consists of the pericardial part of the external layer and the epicardial part of the inner layer of the pericardium. In our experience these layers can often be separated from each other. Occasionally an exudate is found between them especially on the right side. If the surgeon removes only the external cicatricial layer, no results can be expected. The essential part of the operation is the separation of the epicardial layer from the heart muscle. There is usually an intimate connection of the scar with the muscle. The scar may penetrate deep into the muscular wall. Connective tissue strands may reach even into the papillary muscle. In separating these intimately interwoven adhesions from the heart, careless handling may easily cause the heart to rupture. Utmost caution is necessary and although a blunt separation is generally used, the cicatricial strands must be sharply cut. The traction on the pericardium often disturbs the action of the heart and an extra systole may be observed. This is of no consequence and the normal rhythm is regained as soon as the traction is stopped.

PRE OPERATIVE MEASURES

The preparation of the patient includes first of all a good digitalization of the heart muscle. As peroral absorption is restricted, an intravenous dose of digitalinum is administered the day before the operation. It is unnecessary to give diuretics previous to operation. Pleural exudates that mean a direct hindrance to heart action are

tapped shortly before operation. The removal of ascitic fluid is not advisable because of the consequent lability of the vascular system.

The operation can be performed under either general or local anaesthesia. In one case local anaesthesia was used without any disturbance. However, general anaesthesia seems to be more advisable as it is of importance to avoid this formidable psychic effect. The patient is in a slightly elevated half sitting position.

TECHNICAL PROCEDURE

Two ways of approach are feasible depending on the intended surgical plan: the intrapleural route which avoids the opening of the pleura or the transpleural route through the left pleural cavity.

If we intend to have a permanent window in the thoracic cage and wish to decorticate both ventricles, then the technique is as follows. A skin flap is formed which includes the area over the left third, fourth, fifth and sixth ribs, has a lateral base and extends over the midline to the right sternal border, the base broadening out laterally and downward (Fig. 1). After lifting up the flap, the left costal cartilages are cut close to the sternum and a more or less extensive subperiosteal resection of the adjacent ribs is made. The opening is rounded out on the sternal side by pushing back the underlying soft parts and biting off step by step the sternal margin with Luer forceps. If adhesions are present between the anterior chest wall and heart, a sinking back of the heart region will take place. At the upper and lower margins of the opening the internal mammary artery and vein are tied, the intercostal muscles, the transverse thoracic muscle and the endothoracic fascia are removed as far back as possible. Careful haemostasis is made in each layer. The heart with all its surroundings appears now as a whitish homogeneous cicatricial mass. It is surrounded on both sides by the two pleural sacs which have also undergone cicatricial changes and are densely adherent to the pericardial callus. Careful dissection of this callous tissue pushes the pleural layers to the right and left. An opening into one of the pleural cavities can usually be avoided. If it does happen, the opening should be immediately sutured under positive pressure. When the separation of both pleural sacs is completed, they will tend to bulge with each respiration into the field of operation. They are kept back with compresses.

For the next steps of the operation the following points must be observed. It is not possible to distinguish the various parts of the heart from

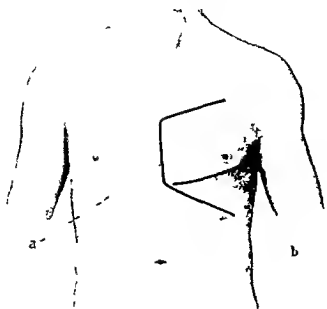


Fig. 1 Line of incision. a by interpleural route b by transpleural route

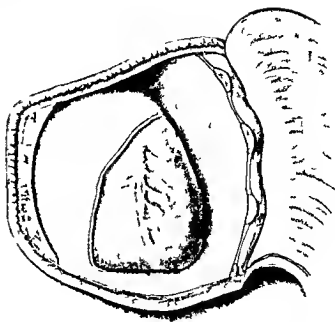


Fig. 2 Diagrammatic sketch after decortication of left ventricle

each other in the massive pericardial and mediastinal scar tissue. As we know from topographical anatomy, practically only the right heart is in contact with the anterior chest wall, namely the right auricle on the right border and a wide plane of the right heart in front. The left heart is only a narrow strip in the formation of the anterior surface of the heart. The position of the left ventricle in its scar coat is made manifest often by its marked pulsation, whereas other parts of the heart do not show any motility at all. The removal of the scar is started on the left heart. After an initial sharp dissection, we work our way down bluntly with Cooper scissors or a Kocher sound. It is impossible to tell in what layer we are, so long as the brown muscle layer does not appear and bulge like a hernia through the defect made in the callus. It is impressive to watch the constricted, pale, muscular tissue regain its normal red color with the gradual release of the scar. The circulation improves immediately. We succeed usually, without much difficulty, in separating the pericardium with a careful equally distributed dissection. The procedure can be best compared with the peeling of an orange. The separated strips of pericardial callus must be excised one by one. There is hardly any danger of injuring the coronary arteries; the callus is easily peeled off in the region of the sulci. The freeing of the left ventricle must be carried to the right as far as the sulcus longitudinalis anterior and upward to the sulcus coronarius, after which we can proceed to the lateral and posterior surfaces.

We encounter in this region, mostly embedded in a cicatricial mass, the left phrenic nerve. In case the nerve does not appear in the superficial layers, where its isolation and preservation is easy, there is no objection to resecting it with the scar.

After the lateral and posterior surface of the left ventricle is freed, the diaphragmatic surface and the apex are separated with sharp and blunt dissection. The result of this is very impressive. The diaphragmatic portion of the callus surrounds this section of the heart like petals. The apex, bound down to the diaphragm, cannot produce the normal systolic retraction. On the contrary, it becomes elongated during the systole and ends in a sharp cone. After this section has been freed, the apex regains its normal systolic retraction (Fig. 2). When the freeing of the left ventricle is completed, provided it is indicated, the anterior and under surfaces of the right ventricle are decorticated. The heart wall is much weaker here, and the muscle tissue has undergone a more extensive cicatrization. Therefore, as we emphasized before, the decortication should be done with special care on this side. As the freeing of the heart progresses, the excursions of the heart beat become larger and larger and illustrate beautifully the unburdening effect of the operation (Fig. 3).

In effecting hemostasis in this chronic inflammatory tissue, we encounter now and then considerable difficulties. In spite of all efforts it may often remain incomplete. Hot saline compresses are repeatedly applied. The use of adrenalin is not advisable. The heart is now beating powerfully.

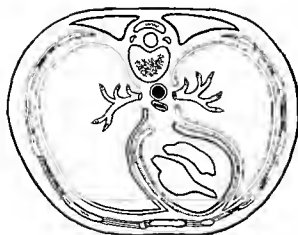


Fig 3a

Fig 3 Cross section through thorax on level with middle of heart a callous pericarditis and great diminution



Fig 3b

in size of heart b condition after decortication of left ventricle

The flap consisting of the overlying soft parts is turned back. It seems wise to excise the remainder of the pectoralis major muscle as an undesirable adhesion to the heart may take place. Before the skin is completely closed two to three small drainage tubes are placed in the remaining large cavity. A large quantity of bloody serous discharge is drained for a few days.

If it is planned to free only the left ventricle from its callous case and there are no adhesions to the anterior chest wall that would necessitate the interpleural route the transpleural way can be selected (Fig 1 b). The left pleural cavity is opened under positive pressure. After incising the left mediastinal pleura the left ventricle is easily and satisfactorily exposed. This is freed now in the manner described above with the approach from the left side. The liberated left ventricle bulges out like a diverticulum and shows vivid pulsation.

AFTER TREATMENT

The after treatment is comparatively simple. The dressings must be changed very often and under the strictest aseptic conditions. There is an abundant serous discharge. The drainage tubes are removed after 24 hours however large quantities of serum escape for the next few days between the sutures. An adequate removal of this fluid surely increases the chances of healing without recurrence.

Of greatest importance is the careful medical and dietetic treatment. The work of the heart is facilitated as much as possible by tapping transudates, especially the ascites. In prognostically favorable cases the cyanosis, dyspnea and

venous engorgement of the neck disappear rapidly. The blood pressure increases and the venous pressure falls. The general condition of the patient improves in an astonishingly short time. In order to control the water metabolism diuresis charts showing the exact figures of intake and output must be plotted. There is a marked tendency to edema. The water deposits are anchored so strongly especially in the lower extremities that their mobilization is difficult in spite of the prevailing good circulation. It is advisable to elevate these parts and bandage them. Besides digitalis, theocin will start diuresis very efficiently. The greatest water output will be obtained by the simultaneous restriction of fluids.

PROGNOSIS

The prognosis is good if the surgical indications pointed out above are observed. Patients who were confined to their beds in a helpless state can take up their work again. Our statistics include 7 patients with 8 operations. Three are perfectly healed and perform their work. 2 who were operated upon recently are definitely improved free from edema and can walk. Their improvement is progressing. In 1 case death ensued 3 weeks after an extensive decortication resulting from a cicatricial myodegeneration. In another case an extensive decortication resulted in an overdistention of the right ventricle with immediate death during the operation.

A question of particular importance is the possibility of new scar tissue formation in place of the excised pericardium. After a follow up of several years' duration, the first case having been

operated on 6 years ago, this fear does not seem warranted. The cases improve more and more as time goes on and in no instance can symptoms of recurring adhesions be found. The fear of adhesions is specially great in cases in which the healing has been disturbed by an inflammatory process. Such was the case in a patient operated

upon 7 months ago, who developed a postoperative pneumonia, a pleuritis of the left side, and a secondary suppuration of the wound. Even in this patient no signs of new fixation can be found on examination.

The prognosis then in regard to late results is equally good.

IRON ORTHOPEDIC CLINIC OF EDWIN W. RIERSON, ST. LUKE'S HOSPITAL

TECHNIQUE OF EQUALIZING LEG LENGTH

By ROBERT O. RITTER, M.D., CHICAGO

MANY patients who have suffered from a deforming disease, such as poliomyelitis, or tuberculosis of the hip, are left with one leg considerably shorter than the other. To them the marked limp or the wearing of a shoe elevation is uncomfortable, unsightly and inconvenient. In children, inequality of leg length is a cause of scoliosis. It is for these reasons that such patients seek relief by surgery. It has been our experience that these unfortunate sufferers can be greatly benefited both physically and mentally by equalizing the length of the two legs.

In a few instances we have lengthened the short leg. We abandoned this operation, however, because of its difficulties and the long period of disability following operation. After a femur has been lengthened, at least a year must elapse before the bone is strong enough for weight bearing, because a full half of the diameter of the bone must be filled in by new bone formation. On the other hand, shortening of the normal femur offers fewer operative difficulties, the operating time is shorter and weight bearing can usually be commenced after about 3 months.

The technique we have developed in our service at St. Luke's Hospital is as follows: First, obtain all the length possible on the affected side by correcting deformities, such as flexion and adduction of the hip and flexion of the knee and by bringing the leg into proper relation to the normal one. The legs are then measured and a section long enough to equalize the legs is removed from the normal femur by the following methods:

The mid portion of the femur is exposed through a lateral incision. The muscles are retracted and pressed down and the shaft held up by a combination retractor and bone elevator devised to meet our needs (Fig. 1). The required section of the femur with its periosteum, is removed by means of a Gigli saw. It is necessary that the sawing be done slowly or that the saw be kept cool by water to prevent the saw from breaking.

An intramedullary beef bone peg is then inserted to hold the fragments in alignment, by first reaming out the canal with a drill the size of the peg so that the peg fits firmly and has to be driven



Fig. 1. Combination retractor and bone elevator. Note Lane dissector on one and Murphy skid on other.



Fig. 2. Roentgenograms taken 8 weeks, 4 months, 8 months and one year after operation.

in with force. The blunt end of the peg is driven half the length of the peg into either fragment desired. On account of the wide separation of the fragments it is easy to engage the tapered end of the peg in the remaining fragment. By force applied in line with the femur the cut ends are pushed into contact.

A one eighth inch hole is drilled through the cortex through the peg and into the cortex of the opposite side. A tight fitting ivory peg of the kind popularized by Magnuson or an autogenous peg made from the removed fragment is driven into this hole. This eliminates the possibility of the splinting peg slipping either way. Only one end of the splinting peg is fastened so that the small fastening peg cannot be broken by accidental torsion of the fragments.

We have found this operation very satisfactory both to the patient and to us. We have not yet had to remove a bone peg for any reason and we have not yet had a non union.

The one most probable source of trouble is from a blood clot forming in the shortened thigh and becoming infected. On account of the considerable shortening the muscles are relaxed. This favors the formation of a blood clot and also relaxes the normal muscle pull so that the bone ends are not pulled firmly into contact. This is the exact opposite of the condition present in the ordinary fractures in which the muscle pull tends to produce overriding of the fragments and consequent deformity.

On account of the possible rotation of the fragments when a round peg is used the technique has been modified by making the pegs square in section and using a smaller sized reaming bit. The soft cancellous bone remaining in the medullary canal after the marrow alone has been removed will allow so firm a fixation of the square peg that rotation can hardly occur.

These pegs should be made from the femur of the beef or from the lower part of the tibia.

A TWO-FLAP INCISION FOR CANCER OF THE BREAST

BY RICHARD R SMITH M.D. F.A.C.S. GRAND RAPIDS MICHIGAN

From the Grand Rapids Clinic

THE use of flaps to cover the denuded area after a radical operation for breast cancer is not new but I can find no reference in the literature to the use of two simple flaps as portrayed in this article. Jackson, as is well known, uses an incision which creates a flap similar to the upper one here described and in the operation as practiced by Dr Edwin Beer, a flap is made which is similar to our lower one. He described this in the *Annals of Surgery* for February, 1925.

In the majority of the operations which I have done in the past 5 years for cancer of the breast, I have used an incision which will permit of the removal of an ample amount of skin and underlying tissues and at the same time leave the arm unhampered by scar, thus allowing the patient a most gratifying use of her arm, a result of great importance. The incision has the further advantage of leaving the chest wall well covered

with a fairly deep, soft, movable layer of skin and fat which makes for comfort and leaves a good appearing area. Further the incision is adaptable to almost every case of breast cancer which is suitable for a radical operation.

The incision begins at about the middle of the clavicle, extends downward and outward to the edge of the pectoralis major, proceeds along its edge to a point near the breast itself, then passes toward the middle line and around the inner side of the breast. Instead of encircling the breast, however, it proceeds straight downward parallel with the sternum to a point well over the edge of the ribs and the upper part of the rectus muscle. It then curves sharply outward and proceeds for several inches to a point which allows of sufficient mobilization of the lower flap. A second incision encircles the breast beginning at the edge of the pectoralis major and passing around the outer side of the breast, then toward the median line to meet the first one. These flaps are raised, the edges of the incision are everywhere well undermined, and the removal of the breast with all of the fascia, muscle, and axillary contents proceeds as in all breast amputations for cancer.

In closing, the lower edge near the axilla which has been made very movable by a wide removal of the tissues underneath is brought up into the

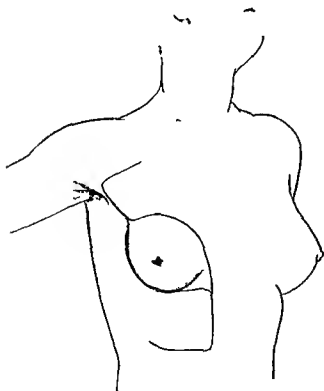


Fig. 1 Shows lines of incision in ordinary case. The dotted ends show variations in length.

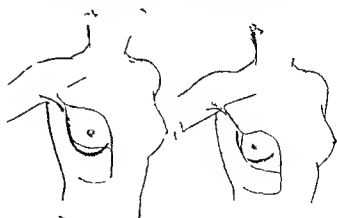


Fig. 2 Same incision used when growth is situated in upper outer quadrant necessitating a greater removal of skin and underlying tissue at this point. The lower flap is made correspondingly larger. The two flaps vary greatly in size according to the case.

Fig. 3 Same incision used when growth is situated in the lower part of the breast. The upper flap is made larger and the lower correspondingly smaller.

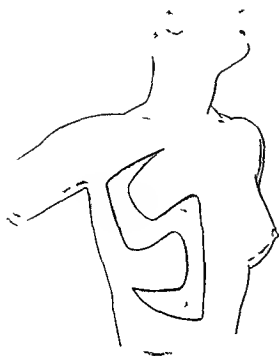


Fig. 4. Shows diagrammatically the denuded area with the two flaps. The flaps are raised and the edge of the incision everywhere well undermined.

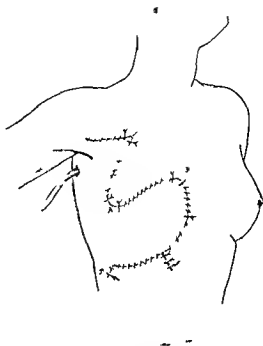


Fig. 5. Flap closed. Note the point at which the silk worm gut sutures are placed to take care of slight tension. The rest is closed with running catgut or with interlocked stitch if preferred.

angle between the upper flap and upper edge of the first incision. The two flaps are then fitted together and the angles at *A*, *B*, *C* and *D* (Fig. 5) closed.

The procedure will vary considerably according to the size, shape and elasticity of the flaps. If the edges have been sufficiently undermined and the flaps well mobilized, there should rarely, if ever, be any difficulty in covering the area without undue tension. It is well to bear in mind that the line from the shoulder to the middle of the sternum may be snug, but without undue tension, for upon it and the early movement of the arm as now commonly practiced, will depend the

freedom of motion of the arm. One must be careful to see that the lower flap has a very wide pedicle, as generally speaking its blood supply is not as good as that of the upper flap. Silk worm gut may be used when there is any tension, but a running catgut suture or interlocked stitch if preferred, may be used to close the parts of the wound which lie easily together. One should be careful not to create sharp angles, for trouble some sloughing is apt to occur at such points.

By making a smaller upper and a correspondingly larger lower flap, or vice versa, one may use this incision for growths situated in almost any part of the breast.

PROCEDURE FOR DETERMINING THE PATENCY OF FALLOPIAN TUBES AT LAPAROTOMY¹

BY J EARL MILES M D BROOKLYN

Assistant Attending Gynecologist and Obstetrician Kings County Hospital

THE question of the patency of the fallopian tubes constantly arises during operations in the female pelvis. A tube may be excised and an incorrect portion thereof be removed when gross inspection and palpation are the only means of diagnosis, and these methods have been the only available means to the surgeon.

The writer has found that an elaboration of the valuable Rubin test can be applied during a laparotomy and thus the patency of each tube be accurately determined along the entire course. The procedure is simple with the apparatus (Fig. 1) described below.

The apparatus consists of two 8 inch tenacula secured to two metal cross pieces through which a long steel cannula is inserted. The said cannula is fitted with a rubber acorn tip $2\frac{1}{4}$ inches from the end. The cannula has a toothed ratchet bar attached. There is a metal collar three sixteenths of an inch wide which is slipped over the cannula and soldered to the ratchet bar $1\frac{1}{2}$ inches from its distal end. The said collar keeps the rubber acorn tip in place. The lower cross piece holds the toothed ratchet arm which is controlled by a spring. A connecting piece is fixed to the proximal end of the cannula and 4 feet of No. 22 rubber tubing is attached thereto. There is a coupling at the center of said tube.² At the other end of the rubber tubing, a rubber bulb is fixed. The bulb, attached to the tubing, can conveniently be placed at a safe distance from the sterile field and so allow the nurse or assistant to manipulate it without breaking the technique of the operation.

The procedure is as follows (Fig. 2).

The patient is put under an anesthetic. A weighted speculum is introduced and the cervix exposed and drawn down with an extra tenaculum forcep. The cervix is painted externally and well up into the internal os with iodine solution. The cannula is introduced under aseptic precautions into the cervix until the acorn tip is flush with the external os. The lateral margins of the cervix are now grasped by both tenacula of the instrument and locked securely. The cannula is then advanced in its ratchet a few notches so as to apply the acorn tip securely to the os and avoid any

leakage of air. The extra tenaculum is then detached. The instrument is tested out to see if there is any leakage around the rubber acorn. If everything is secure, the abdomen is opened (Fig. 3).

The tubes are exposed by the surgeon and the assistant exerts gentle pressure on the rubber bulb. If a tube is constricted in its interstitial portion, of course the tube will show no evidence of the pressure exerted from below, thus accurately diagnosing the tube as an impatent one. With this information, the surgeon can proceed with confidence and accuracy causing the patient a minimum loss of tissue and a maximum value from the operation. The instrument has been used on the gynecological service of the Kings County Hospital in 1925 and 1926 with most pleasing and instructive results.

SUMMARY

The method described is a decided advance in the accuracy of diagnosis of patency of the fallopian tubes at laparotomy.

The said method will aid the surgeon in deciding exactly how much of the tube is to be resected, which decision, to date, has been at best a haphazard procedure.

More women will be allowed to retain tubes or portions of tubes for future pregnancies.

The valuable Rubin test enables us to determine whether gas or air can be introduced through one or both of the tubes. The method here described determines whether one or both tubes are

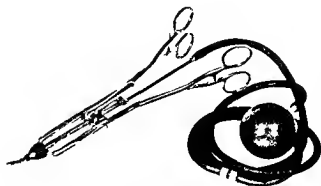


Fig. 1. Photograph of instrument ready for use.

¹Dr. William Schaefer, Jr. generously suggested the coupling which makes it possible for the bulb and the distal half of the tube to be kept sterile while the patient is being draped for laparotomy.

²Read at the meeting of the Brooklyn Gynecological Society, March 1926.

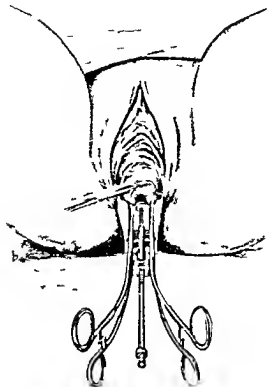


Fig. 2 Showing the instrument in place. Cannula has been wedged tightly into the cervix. An extra tenaculum is used to pull down and hold the cervix while the instrument is applied. (Case was one of moderate degree of prolapse.)

open or the site of constriction at a time when constructive surgery can be applied.

Tubes that are questionable but definitely proved by the test to be closed might better be excised and a possible nidus for future infection in the pelvis thus be removed. Last the surgeon can further his acquaintance in regard to the end results of infection and congenital malformation of the tubes.

The writer thanks Dr. C. E. Rynd, chief of service for the operative cases upon which to use and perfect the instrument and valuable suggestions in the preparation of this paper.

BIBLIOGRAPHY

1. BULLARD E. A. End results of resection of tubes. *Am J Obst* 1919 lxxix 643.
- Note August Martin—first paper on conservation surgery of tubes in 1891.

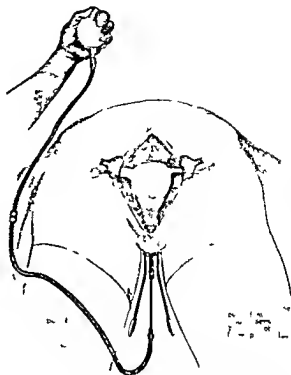


Fig. 3 Schematic view of the instrument in place and functioning while the laparotomy is proceeding. A voluntary sketch of bubbles of air arising around and through a wet sponge as the former leaves the patent fimbriated extremity of the tube in situ.

2. RUBIN I. C. Non-operative determination of patency of fallopian tubes in sterility. Intra uterine inflation with oxygen and production of an artificial pneumo peritoneum. *J Am M Ass* 1920 lxxiv 1017.
3. FURNESS H. D. Rubin simplified test for demonstrating patency of fallopian tubes by injection of carbon dioxide. *Surg Gynec & Obst* 1921 cxxi 567.
4. DICKINSON R. L. Tubal patency test and unsealing by simple air filled pipette. *Am J Obst & Gynec* 1922 lv 159-160.
5. KENNEDY W. T. Method of keeping fallopian tubes open. *Am J Obst & Gynec* 1922 lv 607-608.
6. STONE I. S. Patency of fallopian tubes ascertained by trans uterine injection of fluids. *Am J Obst & Gynec* 1923 v 408-410.
- ALDRIDGE A. H. Insufflation of the uterus and fallopian tubes. report of 600 cases examined by Rubin method. *Am J Obst & Gynec* 1923 vi 53-63.
7. SELLEHEIM H. Inflator for non-operative determination of patency of fallopian tubes. *Zentralbl f Gynaek* 1923 xlvii 1 106-1200.
8. VOLKMAN K. Possibility of infection from Rubin test. *Monatsschr f Geburtsh u Gynaek* 1924 lxxv 201-20.
9. CERRIER G. S. New method of determining patency of fallopian tubes in cases of sterility due to their obstruction. *J Obst & Gynec Brit Emp* 1923 xxx 586-591. (Sorenson apparatus).

- 11 SELHEIM, H. *Med Klin*, 19 3, xix 1509-1513 1540-1542, 15, 0-1574
- 12 OTTOW, B. *Zur Methodik der Tubendurchblasung Zentralbl f Gynaek* xlvii 1752 1759
- 13 ORT D v. *Charcoal or India ink for patency of fallopian tubes Zentralbl f Gynaek* 1925 xlv 546-549 Abstracted *J Am M Ass* 1925, lxxv 1314
- 14 WILLIAMS E, and REYNOLDS R. *Method of determining patency of fallopian tubes by X rays Brit M J* 1925, i 691 692
- 15 RUBIN I C. *Most favorable time for transuterine insufflation to test tubal patency advantages of selecting the postmenstrual phase J Am M Ass* 1925 lxxv 486-489

PRESSURE BAGS FOR SKIN GRAFTING

By FERRIS SMITH, A B, M D F A C S, GRAND RAPIDS, MICHIGAN

From the Grand Rapids Clinic

PRESSURE bags for use in skin grafting are constructed in various shapes and sizes to furnish proper pressure dressing for Wolfe grafts¹

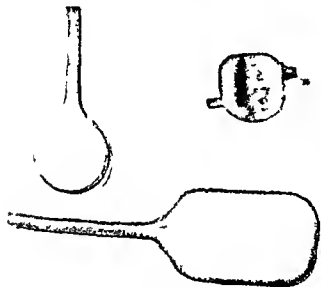


Fig 1, and 3 Pressure bags for skin grafts Figure 3 is the nose bag

The bags are placed over a sterile vessel covering the graft, fixed lightly with either a gauze or a lint bandage supported by adhesive tape, and inflated to a pressure of 30 millimeters of mercury.

It is well to deflate and open the dressing on the fourth day for care of blebs or small pustules that

¹A rational management of skin grafts. *Surg Gynec & Obst* 1926 xli 556



Fig 4 Nose bag in place

occur in the epidermis. This must be done without disturbing the graft in any way. The dressing is replaced and not disturbed until the eighth day, at which time it is removed.

The nose bag (Fig 4) serves several very useful purposes. It not only furnishes a perfect pressure dressing, but presents an ideal method of applying either heat or cold to the part. The upper tube is connected with an irrigator containing either ice and water or hot water maintained at proper temperature. The lower tube drains to a waste basin. A screw clamp regulates the rate of flow to maintain the desired temperature.

PROLONGATION OF LOCAL ANÆSTHESIA¹

By C. DE TAKATS, M.D., CHICAGO
From the State University of Medicine and Surgery

THE value and continuously increasing importance of local anæsthesia is well known to all. The co-operation of the conscious patient during the operation, the possibility of surgical interference on poor risks with impaired function of their organs, and the decrease of postoperative complications are all such advantages that constantly new and wider fields are being opened up for local anæsthesia. It ought to be of great value to improve our present methods in any possible direction. The development of a new technique or the description of new approaches to nerve trunks is one way to progress in this field. Another way is a search for new and more efficient drugs, a chemical and pharmacological question. The use of cocaine was first advised by a Viennese ophthalmologist Kolker in 1884. It was the first step in the development of local anæsthesia. The introduction of the use of the synthetic drug novocain by Einhorn in 1905 was another important landmark. The addition of adrenalin to protract the duration of local anæsthesia was first advised by Braun in 1902 and constituted another important addition. Braun also stipulated certain requirements for the use of drugs as local anæsthetics which are the following: (1) the quantities of the drug employed should be far below the toxic dose; (2) the drug should be soluble in water; (3) it should be stable to sterilization; (4) it should not destroy the effect of adrenalin; (5) it should be absolutely non-irritant to the tissues.

Novocain and procaine seemed to fulfill all these requirements. There was one feature however which stimulated further investigation. It seemed tempting to use for injection an addition of chemical agents which would abolish or diminish postoperative pain by prolonging the duration of anæsthesia. Numerous attempts have and are still being made with quinine along this line. Thibault, Brown, C. W. Allen, Hertzler, Brewster and Rogers, Crile, Schepelmann and recently Finsterer advocate injections of half to one per cent of quinine in order to diminish postoperative pain. It must be noted however that none of these solutions fulfill Braun's fifth requirement. On the contrary, there is always a certain amount of tissue irritation after injections of quinine. Braun called attention to this as early as 1898 and even the most enthusiastic advisers as Hertzler of

St. Louis admit that there can be demonstrated histologically an exudate of fibrin after injections of quinine and urea. Clinically an infiltration of the tissues is observed which is slowly absorbed. Our own observations show that a half per cent solution of hydrochlorate of quinine does not prolong the duration of the usual anæsthesia in the dermal wheel test and it does cause tissue irritation. We shall come back later to this point.

In a search for efficient antiseptics, Morgenroth and his co-workers discovered a series of compounds with increasing disinfectant properties. Their idea was to find drugs which would be highly effective against bacteria but non-irritant to the tissues so that they could be injected without harm. Morgenroth called this tissue antiseptis. He found at the same time that every member of this series of drugs had beside its antiseptic also an anæsthetic property. Through the reduction of quinine into hydrochinin and further substitutions higher homologous compounds ensued forming a chemical series of anæsthetic value (see Chart 1). As tested out on the corner of the rabbit hydrochinin and the next in the series optochin had two and one half to three times stronger effect than quinine. Passing through the next few items in this group a compound was found which anæsthetized in the animal experiment 30 times more effectively than quinine. In other words an anæsthesia of over a half an hour was produced on the cornea of the rabbit with a 3 per cent solution of quinine and a 0.1 per cent solution of this new synthetic drug named eucupin. In regard to cocaine a 2 per cent solution of this drug was necessary to obtain the same effect. Table I shows the comparative value of these drugs. An anæsthesia of over 30 but not more than 90 minutes was the standard to be obtained and this was named normal anæsthesia.

In the discussion following Morgenroth's paper Ungar mentioned the use of 0.2 per cent solution of eucupin for infiltration. However no publication of these cases followed.

It would transgress the limit of this paper if we were to discuss the entire clinical aspect and details of this highly interesting discovery of Morgenroth. Ophthalmologists, urologists, dentists have employed eucupin for the surface anæsthesia of mucous membranes. Painful ulcers, anal fissures have been treated with eucupin. In the present

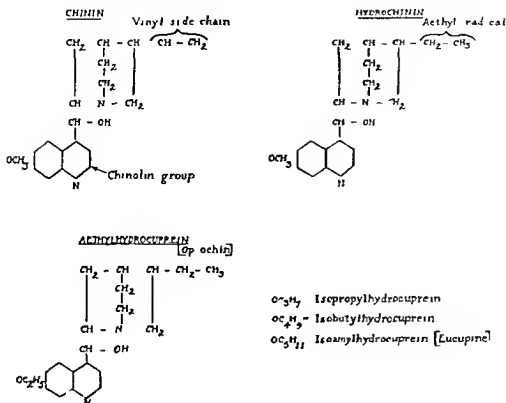


Chart 1 Chemical structure of quinine

study we are interested only in the anæsthesia produced by injection into the tissues. The present work was started in 1919 when a preliminary report was made on infiltration anæsthesia with eucupin (18). The results obtained at that time encouraged us to continue the investigation. Meanwhile Picard confirmed our results concerning the long duration of the anæsthesia but concluded that in order to prevent tissue irritation such weak concentrations have to be used that no prolongation over the ordinary novocain-adrenalin anæsthesia occurred.

The object of our present study was to establish the facts by answering the following questions:

- 1 Does eucupin fulfill the requirements of Braun especially regarding tissue irritation?
- 2 Does eucupin actually prolong the duration of the usual anæsthesia and what further improvement in the solution can be made?
- 3 Does the addition of eucupin to the solution diminish postoperative pain without the slightest sign of tissue irritation or delay in union, in other words has eucupin any practical value?

The answer to the first question is of paramount importance—it is a *conditio sine qua non* of any drug to be used for injections. The toxic dose of eucupin is far above the quantity needed. Oral doses of 2 to 3 grams were given daily without any harm. Solutions used for local anæsthesia are so weak that even an injection of 600 cubic centi-

mers of eucupin would contain only 0.6 grams of this agent. It is therefore innocuous. Its solubility in water is satisfactory as the chloride of eucupin is soluble up to 0.33 per cent and only weaker concentrations can be used.

Sterilizing does not affect this compound, but the alkaline reaction must be avoided just as in novocain and adrenalin solutions by adding a few drops of dilute hydrochloric acid before boiling.

The vasoconstricting effect of adrenalin is not disturbed by eucupin.

The greatest interest is focused on the fact that all quinine derivatives caused tissue irritation at least in the concentrations hitherto used. Both Braun and Haertel mention this in their textbooks. The 0.2 per cent solution of eucupin tested by us and later by Picard is not entirely devoid of tissue reaction. A slight œdema and infiltration of the injected tissue remains for several weeks. The 0.1 per cent solution however, when injected intradermally disappears from 12 to 24 hours entirely. Over 100 dermal wheals were made in order to test out the duration of anæsthesia, none of which showed any sign of tissue irritation. Besides 20 cubic centimeters of this solution was injected into the subcutaneous tissue of the thigh in 10 instances. The needle was not moved during the injection in order to create unfavorable circumstances as a result of

the great pressure of the fluid. No signs of necrosis or infiltrates were seen. Finally microscopic sections were made of subcutaneous tissue infiltrated with eucupin especially to see whether the process of wound healing was disturbed or not. A plastic operation of the face gave us the opportunity to inject 2 cubic centimeters of N A and 2 cubic centimeters of T E A¹ solutions into the subcutaneous tissue of the cheek. An incision each of 2 centimeters in length was made in the infiltrated tissues. Both wounds were immediately closed with a skin clip. After 48 hours both wounds were excised fixed in formalin and embedded in celloidine. The histological examination revealed the following picture. In both slides a thin veil of fibrin holds the cut surfaces together. Polynuclear leucocytes connective tissue cells with several nuclei so-called fibroblasts and proliferating endothelial cells could be seen. In other words the usual picture in wounds healing with primary intention. Small extra

needle. Corresponding places of the forearm were selected and the control injection of 1 per cent of novocain with 10 drops of adrenalin to every 100 cubic centimeters was made on the other arm. The sensibility of the wheal was tested with a fine wire and the duration of the anesthesia was noted. The injections were performed on myself and a junior member of the staff. By this the great individual variations of different patients were eliminated. But even under these conditions only the average of ten injections was compared.

The toxicity of the used concentration of eucupin (0.1 per cent) was tested by the freezing point method and found to be so close to that of water (0.02 degrees C) that 0.9 per cent of sodium chloride had to be used as a solvent in order to make the injected solutions isotonic. We found that the anesthesia caused by injection of eucupin was preceded by a short burning pain of 50 to 60 seconds duration, so that it could not be used alone. First novocain adrenalin, later a new drug tutocain with adrenalin was added so that no pain was felt on injection. This synthetic derivative of an α γ amino alcohol has been produced by Schulemann in the laboratories of Fr. Bayer Co. It is a white crystalline salt a chlorhydrate and is soluble in water from 12 to 20 per cent. The aqueous solutions are neutral and can be sterilized. Adrenalin can be combined with a drug. Pharmacologically tutocain shows definitely stronger anesthetic effects than novocain while the toxicity is hardly higher than that of novocain. From the work of Braun, Finsterer, Laewen, Wiedhopf, it seems that tutocain is a perfect substitute for novocain with the advantage that weaker solutions may be used. Solutions of 0.2 per cent are used for infiltrations, 0.5 to 1 per cent for nerve block and spinal anesthesia.

In using tutocain instead of novocain it was possible to obtain a further prolongation of the anesthesia. In contrast with its synergistic effect with novocain as reported by Hoffmann and Kochmann potassium sulphate shortened quite definitely the duration of tutocain anesthesia and still more that of tutocain eucupin anesthesia.

The following table summarizes the result of dermal wheal tests. The time given is always the average result of 10 individual experiments (Table II).

Further increase of the concentration of eucupin above 0.1 per cent did not seem permissible for reasons that were stated above. The most favorable concentration with which about 100 dermal wheals were made is 0.1 per cent. No reaction of

TABLE I

Drug	Percentage	Duration of anesthesia	Remarks
Cocain (0.5)	1 to 5	30 to 40 min	
Hydrocain	0.1 to 1	30 to 40 min	
A (thylhyd oc p (optocain))	1 to 1.5	3 to 9 min	Normal
Isopropylhyd ocupren	0.1 to 1	3 to 10 min	Normal
Isob. thylhyd ocup	1	3 to 9 min	
1. thylhyd oc p (e. p.)	8 to 10	3 to 10 min	
Isob. thylhyd oc p	1	4 h	

vasates of blood swollen and ruptured cells could be seen around the site of injection. However no difference could be made out between the two slides so that the addition of eucupin has not damaged the tissues or delayed the wound repair. A further study, especially of the histological changes in nerve trunks blocked with this solution is in preparation.

It can be stated therefore that eucupin in the solution 1:1000 fulfills all the requirements that should be asked for in using this drug for local anesthesia.

The second question to be answered is whether eucupin in the concentration of 1:1000 actually prolongs the duration of anesthesia. The method of our experiments was the following. Dermal wheals were made as used first by Schleich, Braun, and others. The drug to be tested was injected intradermally in various percentages, 0.4 cubic centimeters of isotonic solution being injected constantly with the same

¹For the purpose of comparison N A is used in a similar solution. T E A is tutocain eucupin adrenalin in the 1:1000

TABLE II

No	Solution in physiological saline	Duration of anaesthesia	
		— Adrenaline Minutes	— Adrenaline Hour
1	Novocain 1 per cent	10	1
2	Tutocain 0.5 per cent	23	4.4
3	Tutocain 0.5 per cent Potassium sulphate 0.4 per cent	10	2
4	Tutocain 0.5 per cent Eucupin 0.01 per cent	34	4.4
5	Tutocain 0.5 per cent Eucupin 0.05 per cent	32	5
6	Tutocain 0.5 per cent Eucupin 0.1 per cent	35	7
7	Tutocain 0.5 per cent Eucupin 0.1 per cent Potassium sulphate 0.4 per cent	40	5

any sort was observed with this solution. The dermal wheal is anæsthetic for 7 hours, if combination No. 6 is used, compared with $3\frac{1}{2}$ hours of the N A wheal. However, the actual difference between the effect of the two solutions is much greater, because the dermal wheal without eucupin becomes painful immediately after the anaesthesia stops. A hyperæsthesia follows the anæsthetic stage. On the other hand the anaesthesia obtained with eucupin passes into an analgetic stage, painless wheal and also a painless wound is observed even after the anaesthesia is over.

Eucupin then actually prolongs the duration of local anaesthesia. The addition of tutocain instead of novocain means a further improvement.

We arrive now at the discussion of the third and most important question. What is the clinical value of eucupin?

In analyzing and estimating clinical results, the greatest care must be exercised on account of the individual variations in sensibility. Very instructive statistics were published by Honigsmann concerning postoperative pain after local anaesthesia. Of 588 patients, 193 (32 per cent) reported no pain at all, 256 (43 per cent) little or easily tolerable pain, and 136 (25 per cent) acute and lasting pain. Aside from these individual variations, other factors, such as rich nerve supply of the part operated upon, sutures applied under tension, furthermore inflamed tissue are responsible for increased postoperative sensitiveness. We tried to eliminate the sources of error in selecting double-sided lesions of possibly equal extent and using the one side as a control with the usual N A solution. Care was taken to use exactly the same amount of the injected fluid.

Nine such operations were performed. Four cases of double inguinal hernia, four diffuse

gouters, and one double bunion operation were our crucial tests. All patients received a premedication half a gram of veronal and 2 centigrams of morphine. Nothing was given for the night following the operation. The patients were not influenced by any question. On the evening of the operation all patients reported more or less pain on the N A side. Pain on the T E A side was felt uniformly only next morning in each of the nine cases.

The following table gives an account of the results (Table III).

TABLE III

No. of cases	Diagnosis	Quantity of solution	Duration of analgesia Hours
4	Bilateral inguinal hernia	A 50 ccm of 1 per cent N A B 70 ccm of $\frac{1}{2}$ per cent T E A	A 8 B 24
4	Diffuse gout	A 50 ccm of $\frac{1}{2}$ per cent N A B 70 ccm of $\frac{1}{2}$ per cent T E A	A 5 B 24
1	Bilateral bunion	A 50 ccm of 1 per cent N A B 70 ccm of $\frac{1}{2}$ per cent T E A	A 4 B 24

A was always the control side. B the side where eucupin was used. One per cent of novocain was replaced by 0.5 per cent of tutocain and 0.5 per cent of novocain was replaced by 0.1 per cent of tutocain. These percentages were shown to correspond in the dermal wheal tests. The beginning of painful sensations was easier to determine on the N A side than on the T E A side where a more gradual return was noted. This observation could be previously made in the intradermal injection. The analgesia of 24 hours must be interpreted in a way that the first pain was felt during the next morning following the operation. Operations were performed between 8 and 10 in the morning.

Furthermore 100 operations were made under T E A anaesthesia. Cases were selected in which intelligent co-operation of the patient could be expected concerning the intensity and duration of postoperative pain. The list of the operations is the following (Table IV).

TABLE IV

Diagnosis	Number of cases	Duration of analgesia Hours	Complications
Minor operations on head and neck	15	22	1 hematoma
Plastic operations on face	6	21	
Cervical lymph nodes	8	24	
Cuters	10	4	
Abdominal wall block	5	26	
Hernias	5	24	1 hematoma
Phimosis	1	26	
Operations on the hand	15	26	
Bunions	5	30	
Small excisions foreign bodies	20	26	
Primary suture of acute dental wounds	10	26	1 hematoma
Total	100	Average 26 hours	3 hematoma

In this series we note three cases of hematoma. These were aspirated and no further delay in union was observed. Their appearance can hardly be attributed to the injected solution. The anaesthesia lasted uniformly to the next morning. The difficulties and sources of error in obtaining exact data have been mentioned above. A valuable observation was made by a medical student operated on for phimosis. He had felt a throbbing hyperaemia on other occasions after N A injections. This time he had no painful sensation at all. Pain on pressure appeared after 30 hours whereas no spontaneous pain was noted.

All patients had a comfortable first night without any medication. Discomforts of other source than the wound itself such as full bladder, meteoric bowels, etc., cannot be ruled out this way. The tissue reaction has been carefully studied above. It can be again confirmed that even large skin flaps in old patients heavily infiltrated subcutaneous stripes showed no sign of disturbance.

We want to emphasize, however, that the injection of T. E. A. into big nerve trunks or into the spinal canal was not and should not be attempted as long as no experimental proof of the harmlessness of these procedures is available. Eucupin has a strong affinity for nerve tissue and therefore its effect should be carefully studied.

DISCUSSION OF RESULTS

A solution of 0.1 per cent of eucupin combined with 0.2 and 0.5 per cent of tutocain has been used to induce an anaesthesia of longer duration. A further increase in concentration did not seem permissible because as shown in our first report and especially emphasized by Picard, a 0.2 per cent of eucupin solution may cause various grades of tissue reaction. However, Picard's statement that below this concentration no prolongation of the usual N A anaesthesia can be obtained has not been confirmed by our results. The use of tutocain instead of novocain was indicated because it appeared from our intradermal tests that tutocain causes an anaesthesia of longer duration than the double concentration of novocain. With the addition of adrenalin we have found the difference to be still greater. This is probably explained by the fact that the marked vasodilator action of tutocain which causes its too rapid resorption is counteracted by the vasoconstrictor effect of adrenalin. With novocain the difference is not so great although well noticeable. The addition of potassium sulphate as advocated by Wiedhopf but not confirmed by Braun does not lengthen the tutocain anaesthesia. On the contrary it shortens it especially in the presence of eucupin.

A half per cent solution of quinine as advocated by Hertzler, Crile, Finsterer did not lengthen the duration of anaesthesia in the intracutaneous tests; however, there is an actual hypaesthesia in clinical experience. The discrepancy is caused by the fact that in testing the wheel we can note only its lack of sensation. But the duration of analgesia, that is the appearance of spontaneous pain, is always much longer in all quinine derivatives. This explains why the dermal wheel is anaesthetic for 7 hours but the wound for 4 hours. The pain after 24 hours if not gone is so slight that pyramidon will easily alleviate it. In abdominal operations the easy and free breathing which is unimpeded by a painful wound has a great part in avoiding postoperative complications in chest and abdomen.

Anaesthesia of longer duration than 24 hours as for days or a week is not desirable and must result in trophic disturbances. It is not necessarily the chemical irritation that is responsible in these cases; the continuous nerve block may be the cause of poor tissue repair. The analgesia of 24 hours seems to be just the golden mean to alleviate pain.

Another important property of eucupin has to be mentioned here. It is a powerful antiseptic and has already been proposed as a conserving agent for smallpox virus or for novocain ampoules. Bieling's extensive studies show that diphtheria, anthrax, malignant oedema, tetanus bacilli and also the pyogenic cocci were killed in eucupin solutions of 1 to 1000 even in presence of protein-containing media. Only the typhoid coli group showed some resistance. Eucupin was also the first drug advised by Morgenroth for tissue antiseptics; it has been surpassed, however, by acridine derivatives, especially rivinol. A report on the results with this latter drug has been published elsewhere (19).

With the addition of eucupin we not only obtain the prolongation of anaesthesia but add an active conserving agent to our solution. This fact is especially welcome when ampoules are used and kept for a long time.

SUMMARY

1. A combination of tutocain with 0.1 per cent solution of eucupin and the usual dose of adrenalin causes a postoperative analgesia around 24 hours.

2. This combination of drugs is soluble in water, can be sterilized, does not counteract adrenalin and is not toxic in the given quantities. It does not cause any tissue reaction or any disturbance in wound healing as shown by intra-

cutaneous tests, microscopic sections, and 100 operations performed with this solution

3 Tutocain was used instead of novocain, 0.2 per cent tutocain instead of $\frac{1}{2}$ per cent novocain, and 0.5 per cent tutocain instead of 1 per cent novocain because the dermal wheals especially with the addition of adrenalin proved to be longer anesthesia

4 An anesthesia of longer than 24 hours' duration is not considered desirable because of possible trophic disturbances. The advantages of a whole day anesthesia after operation are evident. The subjective ease of the patient, no unnecessary medication, and the avoidance of various post-operative troubles are the result

5 With eucupin a powerful antiseptic is added to our solution and by that the sterility of the injected fluid and of the operative field is augmented

BIBLIOGRAPHY

- 1 ALLEN C W Local and Regional Anesthesia Philadelphia W B Saunders, 1918, p 109-123
- 2 BRILING R Bioch Ztschr, 1918 lxxv 188-211
- 3 BRAUN, H Arch f Klin Chir, 1898, lvi, 370-408
- 4 Idem Klin Wchnschr, 1924 iii 730

- 5 Idem Die oertliche Betaeubung Leipzig Johann Ambrosius Barth, 1925 p 148
- 6 BROWN, E J J Am M Ass 1908, h, 406
- 7 CRILE G W The Thyroid Gland Philadelphia W B Saunders 1922
- 8 FINSSTERER H Wien med Wchnschr 1924 lxxv, 895-899
- 9 HAERTEL, F Die Lokalanesthetie Stuttgart Ferd Enke 1920 p 35
- 10 HERTZLER BREWSTER, and ROGERS J Am M Ass, 1908, lvi, 1393
- 11 Idem Local Anesthesia St Louis Mosby 1925
- 12 HOFERATH H Deutsch Monatschr f Zahnkunde 1924 xlii 105-116
- 13 KRUMBACH H Ztschr f Imm Forsch Originale 1922, xxxiv 6
- 14 MORGENROTH, J and GINSBERG S Berl klin Wchnschr 1912 xlii 2183-2185
- 15 Ibid 1913 l 343-346
- 16 PICARD H Muenchen med Wchnschr 1920 lxxii 808-810
- 17 SCHEFFELMANN E Med klin 1912 viii 1743
- 18 TAKATS GROSZ, G Budapesti orv ujsag 1919 xv 117-116 (Hungarian)
- 19 TAKATS G DE Surg Gynec & Obst 1925 vii 79-91
- 20 THIBAUULT H J Am M Ass, 1907, xlii 1719
- 21 Unger E Abstract of discussion Berl klin Wchnschr 1913 l 180
- 22 WIEDHOFF O Muenchen med Wchnschr 1924 pp 609-610

CONSERVATIVE TREATMENT OF CERVICAL EROSIONS WITH ELECTROCOAGULATION

By FRANK M MIKELS M D, LONG BEACH CALIFORNIA

IN order that a treatment may be called conservative, it must embody the following fundamental principles: first, it must entail the least possible destruction of pathological and adjacent normal tissue to bring about a restoration of the lesion to its former normal condition; second, it must cause the least impairment of the original function of the cervix; third, it must cause the least discomfort and loss of time to the patient; fourth, it must be a simple and convenient method of operative technique requiring the least effort, exertion, and manipulative procedure, both in the original operation and the after care of the patient

A brief resume of the etiology and pathology of cervical erosions is requisite for a thorough understanding of the order of treatment necessary to accomplish these results

A cervical erosion is an area on the vaginal surface of the cervix which is covered with columnar epithelium which presents a reddened, inflamed, rough appearance. This zone of abnormal tissue

has been called frequently ulceration of the cervix, but it is not an ulceration because there is no ulcer nor granulating surface, and because the whole area is still covered with epithelium

The erosion is primarily caused by an irritating vaginal or uterine discharge. The discharge may originate in the vagina from a gonorrheal vaginitis, or in the cervical canal from endocervicitis, or in the body of the uterus from an endometritis. In fact any condition which gives rise to an irritating discharge and comes in contact with the mucous membrane of the cervix may cause an erosion

The reddened appearance of an erosion is due to the development outside of the external os of a surface covering that resembles the mucosa of the cervix having but one layer of cells which are columnar. The underlying vascular tissue shows through this thin layer of columnar epithelial cells and gives the area its red appearance. This red section under the microscope reveals a structure which is covered with a single layer of columnar

epithelial cells. This type may be called a simple erosion. If these epithelial cells proliferate there is a tendency for the surface to become folded forming shallow and deep depressions with tall papillae. This peculiar formation is called a papillary erosion. Quite often the tips of the papillae or the folds become adherent and form cavities or follicles, which become filled with secretion or exudate. This form of erosion is called follicular.

The simple erosion may form a narrow zone around the external os having a fissured or crenated appearance. These small fissures or rhagades are the remains of slight multiple lacerations resulting from the extreme dilatation of the cervix during parturition. This type of erosion may also be complicated with the papillary or follicular formations.

All types of erosions may be complicated with bacterial infection which may cause a more or less extensive mucopurulent discharge.

The simple papillary and follicular erosions may be further complicated with a condition commonly known as cystic degeneration or cystic disease of the cervix. Little blebs of various sizes are located in the zone around the external os. When these small blebs or cysts are punctured a thick mucoid substance exudes from them. Occasionally this substance has a yellowish tinge. A small cavity is left after this substance is evacuated. When the cervix is palpated it has a nodular or indurated feeling which might simulate a condition due to malignant infiltration.

The local treatment of cervical erosions has always been a very perplexing and at times disappointing procedure. The simple cervical erosion due to irritating discharge from a chronic endocervicitis will often clear up under local treatment with a weak solution of nitrate of silver, provided any other primary cause of the lesion is removed. If the discharge is due to a chronic infection of the fallopian tubes it is necessary to remove this cause by the usual surgical methods. It frequently happens that the endocervicitis and the erosion will not respond to local medication or the positive galvanic copper cataphoric treatment. In such cases a superficial coagulation of the eroded surface will not only be followed by a restoration of the mucous membrane of the cervix to a normal condition but also by a clearing up of the endocervicitis. It is evident that the heat generated in the tissues has a definite bactericidal effect.

The technique for this operation is very simple. The patient may be placed in the dorsal position on an auto condensation pad which is connected with the indifferent pole of the d'Arsonval cur-

rent or the common outlet of diathermy current, or while the patient is in the dorsal position on the operating table a 4 or 6 inch square block tin electrode may be applied and connected in the same manner.

The special gold plated electrocoagulation points or blunt electrodes are best adapted for this work. The electrode devised by Dr. Plank which is made of aluminum wire held in a vulcanite handle can be used with great convenience. The electrode which is used for making contact with the lesion should be attached to the low voltage terminal of the diathermy current. The low voltage current is preferable because it gives a much quicker coagulation effect with less irritation and shock to the nerves of the patient. It is possible to coagulate the tissue sufficiently from a d'Arsonval current generated through the Leyden jars.

This operation can be performed without the use of a local or general anesthetic in nearly all cases except in patients who are extremely nervous and sensitive to the effect of electricity or apprehensive about getting a shock. A one per cent solution of novocain with 15 minims of 1:1:1000 solution of adrenalin to each ounce of the novocain solution may be used for the local anesthesia, or nitrous-oxide gas with or without ether may be used for the general anesthesia when it is indicated.

Some operators prefer to use the tubular glass speculum which is introduced deep enough into the vagina to present the cervix in its distal aperture. The only advantage of using the glass speculum is to prevent the spark from arcing across the electrode to the wall of the vagina which causes a very disagreeable sensation on account of the sensory nerve supply of the vaginal mucosa. It is possible to use the d'Vilbiss metal speculum with equal convenience. In using the metal speculum it is necessary to keep the electrode and its handle in the middle line of the vaginal tract and to have the point of the electrode in contact with the cervix before the current is turned on. When this part of the technique is carefully attended to there is very little danger of sparks jumping across from the electrode to the wall of the vagina.

The point of the electrode is burned or plunged into the mucosa to a depth sufficient to include all pathological tissue when the current is turned on. The extent of the coagulation from the point and side of the needle seems to depend a great deal upon the length of time that the current is kept on and the number of milliamperes generated by the flow of the current. Two hundred to five hundred milliamperes will be accompanied by

sufficient heat to get a thorough coagulation of the tissue. When the current is turned on a sizzling sound is discerned which is caused by the action of the heat upon the moisture in the tissues. Little bubbles are noticed on the surface of the membrane. Then the coagulum begins to get firm and becomes adherent to the end of the electrode. Sometimes a portion of the coagulum will come away when the electrode is withdrawn, especially if the application of the electricity has been continued long enough to desiccate the tissue. The coagulum has a whitish or a slightly yellow tinged appearance and when desiccated forms a dark brown crust.

The depth of the coagulation is to be determined by the extent and the depth of the lesion. This can be very easily determined if one has treated a few cases and watched the results following the desquamation of the coagulum. If there is any remaining pathological tissue after the coagulum comes away, it is a very simple procedure to repeat the electrocoagulation sufficiently extensive to include this part of the original lesion and at the same time to destroy any excessive or exuberant granulations which may have formed after the coagulum has cleaved off.

It is impossible to set down any definite fixed rule for dosage and depth of penetration or amount of amperage required for the various kinds of lesions. This part of the work is dependent entirely upon the judgment of the operator, and he must make his determinations upon a basis of previous experience in treating such lesions.

There does not seem to be any danger in performing extensive coagulations. It frequently happens that the cervix is swollen or enlarged three, four, or five times the original size. The depth of the coagulation should be carried at least to the muscular structures of the cervix, and, if necessary, into the mucous membrane of the cervical canal as far as the internal os.

Secondary hemorrhage after desquamation of the slough does not occur very often, but when it has occurred, has been easily controlled by desiccating the bleeding point with either the bipolar or monopolar d'Arsonval current.

In order to substantiate the efficacy of a new departure in the treatment of pathological lesions, it is customary to make a careful check up over a certain period of years and after compiling statistics make comparisons of the data obtained. In the treatment of cervical erosions with electrocoagulation, the results have all been so uniformly satisfactory, with complete restoration of the structure to its former normal condition both in appearance and in function that such a procedure

is not required. Therefore it is only necessary here to cite a few of the many cases which have been treated, selecting one or more from each type of lesion and giving a summary of each patient's history in as brief a form as possible without omitting the salient facts. Events in the past history of the patient which may have some etiological relationship to the lesion should be mentioned. It should suffice to give only a brief description of each lesion and the changes which take place in the progress of recovery from the abnormal to the normal state after it has been electrocoagulated.

The following summaries are only a few of the large number which have been successfully treated by this method.

Mrs. N. A., age 29, married, nullipara. Patient complained of frequent leucorrhoea especially after menstruation. Diagnosis: simple erosion of the cervix. Treatment: Since April 30, 1925, daily antiseptic douches have been used and on several occasions ichthyol suppositories were applied every night for a week or 10 days at a time. Local applications of 2 per cent acridavin, 2 per cent mercuriochrome solution, also 1 to 5 per cent nitrate of silver solution were used on various occasions without satisfactory results. The leucorrhoea persisted and the cervical erosion became more extensive. December 28, 1925, the cervical erosion was coagulated the bipolar current being used. We applied the active electrode composed of aluminum wire with a sharpened point very lightly to the lesion so that a fine spray of current was produced which formed a thin coagulum. This treatment did not cause any discomfort or pain at the time. No anesthetic was used. December 30, 1925, a smooth well organized, and adherent coagulum with a yellowish tint was apparent. January 4, 1926, the edges of the coagulum were cleaving off. Only a slight serous discharge had been present. January 7, 1926, the coagulum was completely desquamated. The smooth mucosa was beginning to reform from the edges over the healthy denuded surface.

Mrs. C. K. H., age 21, married, nullipara, complained of irritating vaginal discharge. Diagnosis: papillary erosion encircling the external os of the cervical canal from which there was exuding a mucopurulent discharge. Treatment: November 11, 1925, complete electrocoagulation of the eroded area was done. A 2 per cent aqueous solution of mercuriochrome was applied every other day until November 18, 1925, when the slough had desquamated. The underlying granulating surface was then treated with a local application of 5 per cent aqueous solution of silver nitrate every other day until November 24, 1925, when the margin of the os showed evidence of slight retraction and the formation of a delicate film of mucous membrane over the denuded surface. Examination of the cervix November 30, 1925, showed complete restoration of the structure to its normal appearance and size.

Mrs. S. C. N., age 28, married, para has complained of frequent leucorrhoea since birth of the last child. Sometimes the discharge was irritating. Diagnosis: follicular erosion extending around the surface of the external os complicated with several small fissures in the right quadrant, the remains of a slight laceration. Treatment: December 21, 1925, electrocoagulation of the lesion was carried well around the outside of the external os into the zone of the healthy mucosa and then carried quite extensively and

deeply into the cervical canal in order to destroy all the diseased glands in the cervical mucosa. This was done without any local anesthetic. Patient complained of a few cramps similar to the cramps which she has during her menstrual period. December 22 1925 the coagulum was well formed and adherent throughout. A slight line of red injection was present at the junction of the coagulum and the normal mucosa membrane. December 23 1925 the coagulum was cleaving off. A profuse serous discharge was present. A 2 per cent solution of mercurochrome was applied to the cervical canal. December 27 1925 part of the coagulum had cleaved off. December 28 1925 a slight show of blood came from a small arteriole in the right quadrant of the cervix at the external os. This was coagulated and desiccated. December 30 1925 the coagulum had completely separated. There was a profuse amount of serous discharge. The granulating surface was treated with a 20 per cent solution of copper sulphate. January 7 1926 the cervix was in apparent normal condition again.

Mrs. I. W. R. age 31 in para complained of a vaginal discharge which has persisted since an operation (subtotal hysterectomy November 14 1925). Diagnosis papillary erosion .5 centimeter in width extending around the external os. A mucopurulent and slightly sanguinous discharge exuded from the cervical canal. Treatment December 10 1925 electrocoagulation of the erosion also of the cervical mucosa up to the proximal end of the canal was done. December 12 1925 the coagulum was well formed and adherent throughout. December 13 1925 the coagulum was still adherent throughout. December 18 1925 the coagulum was beginning to cleave off leaving a red injected surface which did not bleed. December 22 1925 the coagulum was completely cleaved off. December 23 1925 there was a slight tendency for the surface of the cervical canal to bleed when rubbed with a cotton applicator. Ten per cent silver nitrate was applied for hemostatic effect. December 29 1925 the cervix was restored to normal in appearance and the cervical canal was slightly larger than before the electrocoagulation. January 2 1926 the cervix and cervical canal were restored to very near normal in shape size and appearance.

Mrs. B. I. age 43 in para complained of occasional vaginal discharge which has been irritating. She was examined 8 years ago and informed that there was an ulcer on the neck of the womb. Diagnosis follicular erosion involving the anterior lip of the cervix with extensive ectropion of the lesion. A small polypoid hematoma was attached by a small pedicle to the cervical mucosa near the posterior lip. Treatment electrocoagulation of the erosion and the polypoid hematoma. November 18 1925 the coagulum was well formed and adherent throughout. November 20 1925 the coagulum was beginning to cleave off leaving a rough irregular shaped surface which bled very easily. Ten per cent silver nitrate solution was applied. November 23 1925 the coagulum had completely cleaved off but there was an irregular surface at the original site of the lesion with redundant tissue appearing in the cervical canal. It was necessary to electrocoagulate the remaining portion of the original lesion. The surface of the posterior lip was normal in appearance again. November 25 1925 the coagulum was well formed and adherent throughout. November 30 1925 the coagulum was well formed but cleaving slightly. December 2 1925 the coagulum was completely cleaved off. The surface was slightly hemorrhagic. Ten per cent nitrate of silver was applied for hemostatic effect. The lumen of the cervical canal is about twice its original size. December 27 1925 the cervix and the cervical canal were completely restored to normal in shape size and appearance for a patient of her age.

Mrs. L. M. J. age 54 primipara complained that menstruation had been regular up to date (July 10 1925) but during the last 3 years there has been a bloody mucous discharge frequently between periods. There has been a heavy bearing down feeling with uncomfortable pressure in the region of the bladder. Clinical diagnosis fibroid uterus with cystic degeneration of the cervix. Two follicular erosions with extensive ectropion also pedunculated polyp were attached to the cervical mucosa. The cervix was enlarged to about five times the normal size. Microscopic diagnosis hyperplasia of the endometrium cystic degeneration of cervical mucosa with follicular formations. Treatment July 13 1925 interuterine application of 30 milligrams of radium filtered with 1.5 millimeters brass 20 millimeter vulcanite and 20 millimeter para rubber (2,400 milliram hours dose). While the patient was under nitrous oxide gas anesthesia the lesions of the cervix were thoroughly electrocoagulated. July 15 1925 a well formed adherent coagulum involving the cervical canal and region of external os was present. July 28 1925 the coagulum was adherent throughout. July 30 1925 the coagulum was separating and leaving a healthy granulating surface. August 8 1925 the coagulum was completely cleaved off and the denuded surface was slightly hemorrhagic in small spots. A 10 per cent solution of silver nitrate was applied for hemostatic effect and to check exuberant granulations. September 1 1925 the cervix was restored to almost normal size (2 centimeters in diameter) and appearance. December 7 1925 the cervix had regained normal size and appearance. There was no discharge from the cervix. She had not menstruated since the application of radium. Patient reports that she is in excellent health and has no discomfort in the pelvic region.

Mrs. P. D. age 38 married primipara complained of pain in the right side of the neck near the base of the skull for last 3 days. She has had persistent headache mostly over the top with pain in the temples backache in small of back. She has been restless on account of the pain in her head and neck. She gets impatient and everything seems to worry her. She began to menstruate 3 months after the baby was born. Menstruation was regular until this month when she bled twice started then stopped 3 nights ago. Leucorrhoeal discharge has been persistent. Last regular menstruation was January 9 1923. Patient had measles when a baby chicken pox at 15 years influenza at 23 years pregnancy and labor at 26 years typhoid fever at 26 years during puerperium and continuing 3 weeks. Diagnosis stellate laceration of cervix with two large follicular ectropion erosions. Treatment February 1 1923 all the abnormal redundant tissue was electrocoagulated. The lesion was examined every third day and a local application of 1 per cent mercurochrome solution was applied in and around the cervix. December 15 1925 the coagulum was completely cleaved off. Already the margin of the original erosion began to show evidence of the process of squamous cell epithelialization. Smooth mucosa began to form over the healthy granular surface and extended inward toward the os of the cervical canal. About 3 weeks after the operation the crater in the cervical canal was completely covered up to the margin of the external os with smooth intact mucous membrane. The contour of the external os of the cervical canal was irregular.

An interesting result was observed when she returned for a check up of her condition on January 1 1925 after she had given birth to a 7 1/2 pound baby November 20 1924 at which date she had a normal labor without any cervical laceration. One would expect to find the cervix lacerated and with new erosions but instead of this the contour of the crater in the cervical canal was not changed and the mucous

membrane covering the cervix was intact. From this observation it is tenable to draw the conclusion that the reparative processes which follow electrocoagulation of the cervix are not attended with the formation of inelastic scar tissue. The elasticity of the cervical mucosa and the subjacent musculature is not altered or impaired by the effects of electrocoagulation.

In addition to the satisfactory results obtained in the treatment of the local lesion, there was a remarkable change in the constitutional condition of this patient. About the fourth day after the electrocoagulation she noticed that she felt very much better. That her headache had subsided and pains in the back and pelvic region had disappeared. At first there was evidence of autotoxemia probably from the absorption of the inflammatory products of this cervical lesion which had a mucopurulent discharge caused by a mixed bacterial infection.

Before recapitulating, mention should be made here of a very significant statement made by Dr. E. Starr Judd relative to the direful consequences of neglected treatment of erosions: "Cancer of the cervix may develop to a surprising extent before the patient comes for treatment. The first symptom is unusual bleeding or foul discharge, which may also occur with an ulcerated eroded cervix. The cervix of women who have had children is often eroded and such erosion is usually readily distinguished from malignancy. Cancer of the cervix sometimes occurs in women who have not had children, but in most instances the cervix has been lacerated and eroded. The same question arises in these cases of just how much the erosion has to do with the origin of the cancer. In any event it would seem that treating such erosions early might reduce the number of cancers of the cervix." Such a statement as this from so eminent an authority on this subject should suffice to convince us of the paramount importance of proper and early attention to this lesion. He also reports "In nearly 15 per cent of persons who die from cancer, the original trouble is in the female genital organs. The condition of

some of these patients undoubtedly is hopeless from the beginning, while others whose treatment if begun early may be cured."

CONCLUSION

All erosions of the cervix should receive immediate therapeutic attention. If the simple erosion does not respond to medical treatment, it should be completely electrocoagulated and the cervix carefully treated until it is restored to a normal condition. The complicated erosions should be immediately treated with electrocoagulation and sufficiently to remove all pathological tissue.

Electrocoagulation is the most conservative method of treating inflammatory lesions in the region of the cervix and is the greatest safeguard against the development of secondary malignancies.

Electrocoagulation is the method par excellence for extensive lesions of the cervix and is an adequate substitute for surgical enucleation.

Electrocoagulation is superior to surgery for lesions of the cervix because it is not followed by the formation of inelastic scar tissue which interferes with the normal function of the cervix that may be subjected subsequently to dilatation by the process of parturition.

One important physiological effect of electrocoagulation should not be minimized or overlooked and that is the powerful bactericidal properties of the intense heat which is generated in the tissues.

The most consistent and conservative treatment for cervical erosions is electrocoagulation.

REFERENCES

- CROSSON HARRY STURGEON Diseases of Women 4th ed pp 598-601 609-610
JUDD E. STARR The surgical treatment of cancer Bull Cancer Am M Ass, 1925 pp 32, 39

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D.
ALLEN B. KANAVEL, M.D.

Managing Editor
Associate Editor

WILLIAM J. MAYO, M.D.

Chief of Editorial Staff

JULY 1926

NON-UNION OF THE NECK OF THE FEMUR

THE abduction method of treating fresh fractures of the hip gives a much higher percentage of good results than was formerly thought possible. This is evidenced by the recent report of Lofberg¹ who reports 306 cases treated at Malmo with 67 per cent of cures in the cases of mesial fracture and 100 per cent in the cases of the lateral or trochanteric type. The carrying out of this treatment demands willingness on the part of the patient and sustained interest and accurate knowledge of the pathological changes on the part of the surgeon. The treatment is necessarily prolonged and confining. For various reasons the golden opportunity for the proper treatment in a certain percentage of cases will be permitted to slip by and non union will ensue. That non union occurs as frequently as it does is no credit to modern surgery. The fault lies not so much in the kind of treatment afforded, although only too often the treatment is half hearted and inadequate, as in the fact that no diagnosis is made at the time of

the injury and the patients are permitted to go untreated.

The disability consequent to non union of the hip is due to lack of skeletal support, and function can only be restored through extraordinarily strong fibrous union, osseous union at the fracture, or by some operative procedure to re-establish the missing skeletal support. If fibrous union is sufficient to permit the individual to carry on with reasonable comfort, nothing need be done. When disability and discomfort are great, however, the various procedures that may be employed for relief should be considered. The patient who is to be operated on should be in good health. He should not be too old and should be prepared to make the sacrifices for the necessary confinement. The various operations are not easy and the resulting mortality rate, even under favorable conditions, is not less than 5 or 6 per cent. Such operations should therefore not be undertaken lightly.

The operation of choice is that wherein osseous union is sought by aid of the bone graft. In properly selected cases the percentage of successful results will compare favorably with that of bone grafts in other parts of the body. The bone graft is not only an excellent mechanical means of holding the fragments together but it also stimulates the formation of bone.

If so much of the neck of the femur has been absorbed that the bone graft is not deemed feasible, and if the patient is reasonably young, Brackett's operation is probably the next choice. In this operation the top of the trochanter with its attached muscles is lifted upward, the fractured surface of the head

Lofberg O. The treatment of fractures of the neck of femur. *Acta Chir. Scand.* 1924, 49: 54-537.

freshened, and the neck remodeled, freshened, and placed against the denuded head

In older patients, however, when non-union has existed for a long time and the neck has been absorbed, the operation may be limited merely to securing skeletal support. The operations suggested by Whitman and Albee are useful. These operations consist in removing the head of the femur, reshaping the upper end of the femur, and placing this reconstructed end in the acetabulum. The motion may be somewhat limited following such an operation, but stability is quite satisfactory.

The surgeon of today should, therefore, feel that to combat this disabling condition is well worth while. It is unfair to the patients to be dismissed with the old advice that nothing can be done but that strong fibrous union may take place in time, and that in three or four years they may be able to walk without crutches. By making use of the operations mentioned, eighty per cent of the patients may be restored to usefulness and relieved from pain. Such a percentage of satisfactory results places the surgical procedure on a par with accepted methods for other conditions.

MELVIN S. HENDERSON

HEADACHES AND INTRANASAL SURGERY

CERTAIN headaches may be caused by an abnormality or disease in the nose, and the well directed observations of such cases will usually result in a diagnosis.

It is unfortunate that many patients are subjected to intranasal operations for the relief of headaches that are not due to intranasal cause. In this event new symptoms are added to the old, and the patient is far more uncomfortable than before operation. If, however, a definite causative lesion can be

found within the nose, well directed intranasal operative interference will relieve the patient.

The attitude with regard to destructive intranasal operations is becoming more conservative and as our knowledge has increased concerning the various types of headache, it is easier to differentiate the causal factors involved. The various types of migraine, or hemicrania, offer perhaps the greatest difficulty in the differential diagnosis. Many patients are observed who have been subjected to intranasal operative procedures for the relief of this type of headache without relief from symptoms.

Ordinarily, it may be said that headaches due to intranasal lesions occur daily at about the same time of day, or under the same conditions, they do not continue throughout the day. This is particularly true of disease within the paranasal sinuses. Headaches due to swelling of the nasal mucous membranes occur under environmental conditions which cause the membranes to swell and come in tight contact. In such a case, if shrinkage of the membranes during the headache causes complete relief from the symptoms, a rather definite diagnosis can be made. In many instances measures may be undertaken which will permanently relieve such a headache. Such measures may consist of correcting an abnormality of the nasal septum, even though the patient was conscious of no obstruction, and correcting an impaction of the middle turbinate from the middle meatus, crushing a large middle turbinate without removing it will occasionally relieve the symptoms. The impacted middle turbinate is usually associated with what has been called the vacuum frontal headache.

The various types of migraine headaches do not respond to such measures. These headaches do not occur daily, and there is a

periodicity of occurrence with intervals of freedom. The patient may associate the trouble with a gastric disturbance, which in reality may be but a part of the clinical picture. The history may have extended over a period of years and there may be a family tendency.

One would hardly expect to relieve headache due to an intracranial lesion or a toxic condition by intranasal surgery. Cushing has called attention to this. Many patients, however, have been subjected to intranasal operations for the relief of such headaches. The paranasal sinuses are perhaps the most frequently attacked, particularly the ethmoid cells notwithstanding the fact that the most skillful rhinologist undertakes operations on the ethmoid cells with great caution. It would be quite impossible to determine when the ethmoid labyrinth has been completely

extirpated. It may be expected that the scarring over of the remaining cells will derange the function whatever it may be and cause other symptoms.

Sluder has called attention to the headaches due to derangement of the function of the nasal ganglion. Operation is not always indicated in these cases, in fact, in certain cases operative interference will aggravate the symptoms.

It is evident that before intranasal operative interference is resorted to for the relief of headache the surgeon should be reasonably certain that the patient will be benefited by operation. Great care must be exercised in the choice of the patient for operation and in the selection of operation for the patient, if we hope to secure relief from headache through operative interference.

H I LILLIE



HERBERT L. BURRELL
1856-1910

MASTER SURGEONS OF AMERICA

HERBERT LESLIE BURRELL

He had a passion for service

SOMETIME surgeon on the staff of the Boston City Hospital, surgeon general of the State of Massachusetts, professor of surgery in the Harvard Medical School, medical superintendent of the hospital ship Bay State, president of the Massachusetts Red Cross Society, past grand master of the Massachusetts Lodge of Masonry, and president of the American Medical Association—by these titles may be epitomized the work of the subject of this sketch before he passed on to eternity.

Nature was generous, I might say lavish, in the bestowal of her gifts on him. She provided him with a well proportioned frame, surmounted by a fine head adorned with a distinguished face and a strong imaginative mind. Supplementing it was an unusual gracious and magnetic personality, which made him a rare companion and friend.

Some of his minor characteristics that have impressed my memory were his delightful conversational power, attic in quality and seasoned by mature judgment, and his omnivorous tastes. At one time he sang baritone in a church choir and for this service he was presented with a gold watch, which he carried during his life. At another time he became interested in target shooting, going to England with the All-American Rifle Team, which won the match. He early became fascinated with military matters, eventually attaining the rank of major in the picturesque troop, "The Boston Lancers." Later he became medical director of the First Brigade, M V S M. In connection with this subject he indulged in the pastime of making a collection of illustrations of the world's military uniforms. Again, he devoted his attention to improving the transportation apparatus and the personnel of the hospital corps.

In his early medical career when he had more leisure, he was a prolific writer. His textbook on surgery remains incomplete because of the caprice of the Unknown Force. It is to be noted that this book was the first and only thing he ever essayed to do and left undone, although the manuscript was ready for the publisher. With him, to begin was to finish. Thus in medicine, Masonry, and the military he quitted only at the top.

Easy in manners, soft in voice, and with a self confidence singularly free of prejudices and egotism, he was at home, whether it was in the amphitheatre, at

the Court of St. James, or in domestic circles. A cosmopolite in traits and habits Burrell was essentially a man of the world. That he held office or membership in many miscellaneous clubs, societies and associations, and was visiting surgeon or consultant to important hospitals is to be taken for granted. A mere catalogue of them would be both prosaic and a waste of space.

Burrell was born in Boston, April 27, 1856. His father was engaged in the manufacture of pianos. He sprang from a typical New England family. His progenitors were English who early came to Massachusetts Bay Colony.

He began his battle of existence without the support of friends influential in the profession or the benefits derived from a college education. All that he won was due to his own self development and determination. In some measure his success may be referred to the effort demanded to surmount the barriers that he encountered for he was one of those whose forces are fed by obstacles and whose resolution hardens in the face of difficulties. When about 18 or 19 years of age he entered a broker's office in New York. While employed in this manner he happened to go with a medical student to one of the surgical clinics to witness an operation. In speaking about this incident later in life he said that the art at once attracted him and he felt that he could improve on the technique or rather lack of technique that the operator displayed. Thereupon he returned to Boston and entered the Harvard Medical School graduating when he was 23 years old. The careful thought that he gave this determination to become a doctor was typical of the man in all his future activities. In no sense did he drift into the profession.

Thus he made his advent into a profession where intellectual satisfactions are more precious than gold where apparently trivial things become baffling profound and fascinating, where revelation follows observation and skillful questioning, and where wonder grows with knowledge.

His first wife was Lillian T. Thorndike daughter of the widely known Boston surgeon William H. Thorndike. About two years after the death of his first wife he married Miss Caroline W. Cayford. This marriage was the outcome of a romance of the Spanish American war when he met Miss Cayford on board the hospital ship Bay State where she was serving under him in the capacity of head nurse. From the second marriage he had an issue of two sons.

Even before he received his degree in medicine he was appointed to the staff of the Boston City Hospital and remained connected with this institution during his entire life, being made surgeon in chief in 1907. His teaching career began with his appointment as demonstrator in bandaging and apparatus at the Harvard Medical School in 1887. In the following 20 years he was made successively, instructor, assistant professor, professor of clinical surgery and finally a full professor in 1907. During these years he devoted much time to the development of the Children's Hospital and orthopedic surgery.

Dr E H Bradford in referring to his activities before the Boston Historical and Memorial Society says "For any one in a few weeks to have organized and equipped a relief ship is no small achievement but it was the work of a master mind to have transformed a coaster into a model hospital ship, studied abroad and prized by the national government Any one who had an opportunity to visit the hole of the Bay State on her return from Santiago with her precious cargo of fever stricken Massachusetts soldiers, and to bear witness to the fact that the air even over the bilge keel was as fresh as that of the open ocean, and who saw a service and organization superior to that of the best of hospitals, could recognize the debt not only of the suffering Massachusetts soldiers, but that of the commonwealth, to this volunteer surgeon, who directed and commanded three expeditions of relief during that summer of anxiety and confusion

As a surgeon general of our state he greatly increased the efficiency of the medical service of the militia and he left it a model in excellence of equipment

His work on the reception committee for the Boston meeting of the American Medical Association placed him foremost among organizers for such undertakings, and in the reorganization of the Red Cross Society, in the establishment of the Society of Military Surgeons, as secretary of the National Surgical Association, and as president of The Massachusetts Medical Society he proved the high quality of his leadership The presidency of the American Medical Association came to him as a well won honor, but his careful plans for the advancement of the interests of that powerful organization were frustrated by the malady which brought his labors to an end

The practice of surgery in America 30 years ago was excellent in quality, but there were marked defects in our hospital organizations which cramped the development of the average surgeon Three months of active hospital surgical work and 9 months of general practice did not offer the best chance for the training of surgeons of the greatest experience Dr Burrell endeavored to establish a continued service in the place of the short service then universal in American hospitals, and he succeeded early in his career in arranging a continued surgical service at the Boston Children's Hospital, although in the large civic hospital with which he was connected all of his professional life the establishment of a single continued service under one head was impossible The grouping of services of a selected number of surgeons, graded according to skill and seniority, and working under one leadership, seemed to give the organization many advantages It furnished a stimulus from combined efforts with a single direction continued from year to year This system was finally adopted largely through the efforts of Dr Burrell

The teaching of surgery, formerly consisting of brilliant lectures by surgical leaders or clinics where the masters of their craft displayed their skill in rare operations to a sensation loving class, needed to be changed The careful study of

patients, by small groups of students, who, under the direction of trained teachers, learn thoroughness of observation and skill of hand, presents a system of education which is of high excellence, but one which needs the enrollment of a number of earnest instructors, working less for personal advancement than from devoted interest in their profession. It was to the development of this system that Dr Burrell gave the chief energies of his life.

His literary labors show extraordinary industry and cover an extensive and varied field in surgery, medical education and non professional articles. Some of the operations which he successfully performed marked a new era in surgical procedure. Thus he reduced a fracture of the spine, supposing it was done for the first time, though afterward he discovered that a similar operation had been performed by Weist. This method of treating fractures of the spine lowered the mortality more than 33 per cent. He was the first to replace a trephine button as a whole. He treated a case of anthrax with complete recovery, the first in many years and reported it as original although it was later found that his method was one that had once been employed but forgotten. He removed from a patient the sternum and sternoclavicular articulation, ligating the innominate artery and was rewarded by complete success, the recovery being the third known in the annals of surgery. He devised a new and original operation for obviating habitual or recurrent dislocation of the shoulder and this method based on sound anatomical grounds was recognized by later writers of textbooks. He was the first in America to establish the diagnosis of traumatic apnoea or asphyxia in a living patient.

Among his conspicuous attributes were his power as an organizer and administrator and the ability he possessed of being able to select men and get them to carry out a piece of work without further oversight on his part. He was essentially a constructive worker. Burrell was without qualification a superb idealist. When once convinced that his course was right he pursued it unrelentlessly and with a slavish devotion. A friend who knew him well remarked that the dominant note in his life could be summed up in the caption which I have written under the title of this sketch.

It is not surprising that a man of such vigorous energy and positive nature should have created opposition to his projects. He naturally had a high temper which however, he usually held in control. He was, nevertheless, a generous opponent and was ever ready freely and frankly to admit his mistakes.

For a student, interne, young doctor, or colleague to have his friendship meant that he had a recommendation both powerful and far reaching. To be associated with him made medical preferment almost certain.

Before I end this record of the 54 years of the life of Herbert Leslie Burrell I do wish in the words of the prophet Isaiah that I may again "declare his doings make mention that his name be respected for he did many excellent things."

TOWNSEND W. THORNDIKE

CORRESPONDENCE

GASTRIC RESECTION WITH TELESCOPIC ANASTOMOSIS

To the Editor The "Method of Gastric Resection with Telescopic Anastomosis," described by W W Babcock in March, 1926 was described in 1922 under the name of 'Einmaschettierungsverfahren' by R Goepel, of Leipzig At the same time, or just before, Gara and Mandl had experimentally developed a method of 'Serosaplastik' based on the same principle, especially available for anastomosis of parts of the intestinal tract that are only partially surrounded by serosa

In writing this note it is not my intention to raise a question of priority, but only to point out that the method is well known to all acquainted with the international literature My references, which may not be complete, certainly show that this subject has been already widely discussed The little following that Goepel's operation has found is due to the unsatisfactory results of the animal experimentation

A Schubert and T Beer published a very extensive and conclusive work showing the dangers of this suture According to these experiments, the weak point lies in the first row of sutures between the duodenal wall and mucosa of the stomach Such a suture has the same physiopathological character as the mucosa sutures, namely, that of becoming unloosened after two or three days, as was long ago pointed out by Marchand At this time, the union between the muscular layers of the stomach and the duodenum is not strong enough to prevent diffusion of gastric fluids between invaginated parts Abscess formation has been found with eventual contamination of the peritoneum An unsuccessful case, operated on by Noetzel, showed at the autopsy that peritonitis was due to leakage as observed in the experiments In other words, the cuff of the seromuscular coat of the stomach surrounding the

duodenal wall does not heal as quickly as the coaptation of the serosa with the classic Lambert suture The conclusion of this important argument is given by Schubert and Beer as follows

'The telescopic method (Einmaschettierungsverfahren) of Goepel Mandl and Gara, does not increase the safety of the sutures, as at the moment when suture of the duodenal wall and stomach mucosa becomes unloosened, there does not yet exist cohesion between the exterior wall of the duodenum and the cuff of the stomach'

Though the experience of Goepel, according to his last article, has reached 200 cases of gastric resection, it seems to be very doubtful to me that this technique may ever become the method of election for the Billroth No I My doubt is aroused not only by the result of the experiments on animals but also by the fact that Goepel, himself, with an important number of cases has refrained up to date from giving an exact account of his immediate operative results

New York

VINCENT GAUDIANI

REFERENCES

1. MANDL and GARA Experimentelles zur Naht nicht pentonealisierter Darmabschnitte nach Resektion Zentralbl f Chir 1922 p 1835
2. GOEPEL R Die Directe Wiedervereinigung von Magen und Duodenum nach Magenresektion durch das Einmaschettierungsverfahren Zentralbl f Chir, 1923 No 6
3. MANDL and GARA Bemerkungen zur Goepel Mittheilung Zentralbl f Chir, 19 3 No 16
4. GOEPEL R Zum Einmaschettierungsverfahren Zentralbl f Chir, 1923 No 30 19 4 No 45, 1923 No 31
5. SCHUBERT A and BEER T Experimenteller Beitrag zur Technik der Magen Darmnaht Verhandl d d Gesellsch f Chir, Arch f Chir cxxxix, 537

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING OF THE CHICAGO GYNECOLOGICAL SOCIETY HELD JANUARY 15, 1926,
DR D S HILLIS, PRESIDING

MIXED CELL SARCOMA OF THE UTERUS

DR A H CURTIS The specimen presented when seen under the microscope is a mixed cell malignant tumor usually called a mixed cell sarcoma. The material was curetted from a 62 year old patient a week ago.

She had had a purulent leucorrhoea for about 4 years and for the last 2 years had been bleeding moderately. The uterus was very soft and 5 inches in depth. The history was suggestive of carcinoma but the curetted material was a little atypical. There was no question from the gross scrapings but that we had to deal with a malignancy.

Microscopic examination shows nests of various types of cells—epithelial cells, endothelium like cells and various mixed types of cells of a malignant character including also several epithelial pearls.

Dr Watkins and Dr Jones had a similar specimen about a year ago. It was obtained by hysterectomy. This is therefore the second one in our experience.

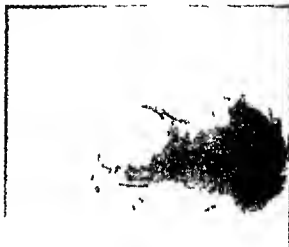
DR H O JONES The only outstanding thing about the case referred to by Dr Curtis was that the tumor was removed and we subsequently did a radical vaginal operation. These hardened areas were thought to be either early calcification in a fibroid or possibly an adenoma. We made a little survey of the literature and found such tumors were quite rare.

DISAPPEARING OVARIAN CYST

DR IRVING F STEEL I wish to place on record a case which falls into the group of rarely reported ovarian cysts, those which Dr Ernst Ries reported as alternating periodic ovarian swellings. I prefer in this instance to call the case one of spontaneously disappearing ovarian cyst because I did not observe the alternating periods as Dr Ries did.

The patient was a young woman 20 years of age who gave a history of having been married 3 years without pregnancy. She was referred to me by an ophthalmologist (Dr Gradle) because of the possibility of some reflex pelvic disturbance.

On examination it was found that she had a smooth ovarian tumor about 6 or 7 centimeters in diameter freely movable in the left adnexa. Because there was a history of sterility and negative smears were obtained from the urethra, vagina and cervix a patency test was made on July 27, 1925 a



Roentgenogram of Stein's disappearing cyst of the ovary (Pneumoperitoneum)

few days after her first visit. Her last menstrual period was July 3. The gas passed through the tubes very readily under low pressure. A liter of carbon dioxide gas was allowed to pass into the abdomen. A roentgenogram was taken with the patient in the partial knee chest position which verified the diagnosis of ovarian cyst (Fig 1). On the film the cyst appeared to be about the size of a tennis ball.

About 18 days after the first examination and without re-examination the abdomen was opened and much to my surprise and chagrin there was no ovarian cyst. The ovary on the left presented a slightly uneven appearance and three very small cysts not over 1/4 centimeter in size could be seen on the surface. In order to check up the condition and to determine the nature of the small cystic areas a resection of the cystic portion of the ovary was made and a plastic operation done. The appendix was taken out. There was also a small myoma about 1 centimeter in diameter in the posterior wall of the uterus which was enucleated. I mention that because in one of Dr Ries' cases myoma was present along with the alternating cysts and

all of in 1 of his cases there was a history of 3 years' sterility. The pathological report on my case was as follows:

A section of ovary contains three cysts. The larger, about 0.5 centimeter in diameter, is lined by a row of cells the most superficial of which is flattened into a syncytium like border. This lining contains numerous thin walled blood vessels, and at one point it forms in the lumen a papilliform projection composed of cells having the appearance of lutein cells. The cyst contains hemorrhagic material and there is considerable evidence of hemorrhage throughout."

I think this makes the fourth case on record. I have been unable thus far to find any other cases of disappearing cyst or alternating periodic ovarian swellings aside from the so called lutein cysts that have been described as associated with hydatid mole.

DR CHARLES BACON. I am surprised to hear the opinion that these cysts are so rare. I remember hearing the report of Dr. Ries but I do not think the statement was made at that time that they were so rare. I, myself, have seen several cases in which these tumors of various sizes, sometimes quite as large as those mentioned, have disappeared.

DR N. S. HEANEY. Undoubtedly this disappearing cyst of Dr. Stein's is one of corpus luteum origin, the sort which we so frequently see in early pregnancy and which also occurs without pregnancy. I have met them often. We are able to diagnose these cysts in patients through repeated examinations. Patients will be found to have a tumor of the ovary, sometimes as large as an orange at one examination and a few weeks later this tumor will have disappeared. These cysts are so well known that I do not advise operation in a case of ovarian cysts, when the cyst is the size of a fist or smaller unless upon subsequent examination the cyst is still there. It is not an uncommon thing to have these cysts rupture during examination and I do not hesitate to use light pressure upon them to produce a rupture as that is all that is necessary to cause their cure. Should one, through error, operate while the cyst is still present, the cyst should be incised and the ovary should not be removed. I am quite certain that there is nothing unusual about this case of Dr. Stein's, that it is a corpus luteum cyst, and does not require a new name.

It may interest you to know that these cysts are not uncommon in cattle, that the veterinarian is well acquainted with the condition and that the therapy is to rupture the cyst manually.

For the sake of the records, I would like to make one other point and that is, that the pneumoperitoneum did not show that this case of Dr. Stein's was a cystoma. The plate shows a swelling, round and globular which is undoubtedly the ovary. A corpus luteum cyst is not a cystoma and therefore, the X-ray plate does not determine the classification.

DR CARL HENRY DAVIS. Milwaukee. About 5 years ago I was much chagrined when a patient with my diagnosis of probable tubal pregnancy returned

some days later to Dr. Paddock, who had cared for her before, and he did not find the swelling. Subsequent examinations showed that there was a tendency for these enlargements of the right adnexa to appear periodically. I have seen several patients in early pregnancy who had enlarged adnexa or a cyst which made me think of a possible ectopic pregnancy yet a few weeks later no enlargement was evident. We have followed the rule of rest until the cyst disappears or the diagnosis of ectopic pregnancy is confirmed.

Dr. Stein's case also emphasizes the fact that in gynecological work it is not always advisable to make a diagnosis the first time you see the patient. A patient who has not been examined for a period of several weeks should have another examination before she is prepared for operation and if there is any question examination should be made under an anesthetic.

DR C. B. REED. I have had no cases in which this type of tumor was associated with pregnancy but several with sterility. One patient came to me with exactly the same history as that described in the case under consideration. She wished immediate operation which was refused and an appointment was made for another examination 2 months later. In the meanwhile she took various medications and when she came back I found no tumor. She said a doctor had removed it by medication. I do not think the condition is uncommon.

DR IRVING F. STEIN (closing). I did not mean to convey the idea that the swellings were so uncommon but that they had been rarely reported as alternating swellings or disappearing cysts. Dr. Ries in his second paper on the subject outlined four different types of corpus luteum cysts, including the type Dr. Heaney described the type we are describing, and the type found in the patient that passes from one gynecologist to another, one man finding nothing, the next man a swelling and the third a tumor on the opposite side. The pathological description which I read was that of a corpus luteum cyst.

As to the question of removing the ovary, I said that the ovary was not removed but was resected for the purpose of checking up or proving whether it was a corpus luteum cyst. This case was not associated with a suspected pregnancy but with sterility and therefore differs from the type found in that more common syndrome.

The question as to whether we should remove such a cyst is unsettled. I do not know that we have a very definite teaching in such cases. It is too soon to know whether this patient will become pregnant as a result of the removal of the abnormal portion of that ovary.

I think one point could be emphasized and that is that these cysts can be portrayed on the X-ray film as a matter of record. This patient was not examined after the first visit so the cyst was not ruptured by palpation either intentionally or unintentionally. I think most of us would hesitate to

attempt to rupture a corpus luteum cyst sight unseen particularly if it were at all possible that an ectopic pregnancy could be present

A CASE OF PURPURA HÆMORRHAGICA COMPLICATING PREGNANCY, RATIONALE OF TREATMENT

DR GEORGE T. STREAN I wish to report this case on account of both its rarity and the encouraging results obtained from the treatment instituted

Mrs M. white aged 23 married 5 years born in Illinois in para came to the Chicago Lying in Hospital Clinic first when she was 4 months pregnant June 20 1925 complaining of nose bleeds bleeding gums and extensive subcutaneous hemorrhages on both legs and arms

The family history was negative The personal history showed appendectomy measles diphtheria scarlet fever and pneumonia Menstruation began at the age of 12 was regular every 28 days lasting 7 days moderate in amount, with no pain

The first pregnancy in 1911 ended in a forceps delivery The child a bleeder bled through the cord dressing The puerperium was normal The second pregnancy terminated in abortion at 2 months in 1923 In the third pregnancy blue spots were first noticed on the body when she was 2 months pregnant These became more extensive Nose bleed and bleeding gums were next noted She was admitted to the hospital when 5 months pregnant A diagnosis of chronic endocarditis with purpura was made and the patient treated expectantly The condition improved with rest in bed She was delivered April 15 1923 at term with a postpartum hemorrhage On April 25 1923 a severe secondary hemorrhage resulted in the loss of about 1500 cubic centimeters of blood The vagina was packed and 3 blood transfusions were given Horse serum was used also The patient was discharged 34 days postpartum May 19 1923 The red blood count went up from 2 397 000 to 3 300 000 The platelets remained low about 25 000 The child is alive with no tendency to bleed

Present pregnancy The last menses began February 15 1925 She noticed the same conditions as during the previous pregnancy that is nose bleeds bleeding gums and extensive hemorrhagic areas on all extremities some about 8 centimeters in diameter

She came to the clinic June 20 1925 4 months pregnant The pelvis was roomy and the salt pots were normal red blood cells 4 624 000 white blood cells 12 000 leucocytes 18 neutrophils 82 platelets 25 000 The differential smear was negative A general tonic treatment was instituted with calcium lactate gelatine and quartz lamp The condition gradually became worse Permission was obtained from Dr DeLee to try out a new plan of treatment It was noted that the husband's and patient's bloods were incompatible that the blood of the first child (normal pregnancy) was compatible with that of the patient and incompatible with that of the father and that the blood of the second child

(pathological pregnancy) was incompatible with that of the patient but compatible with that of the father So it was concluded that the toxin affecting the patient was a predominating hereditary harmful influence from the paternal side So we decided to immunize the patient with the husband's blood against this foreign protein and we proceeded as follows

From the husband's median basilic vein 15 to 20 cubic centimeters of whole blood was drawn and injected subscapularly every 5 days In all 27 injections were given It was noted that after the second injection the patient stated that she felt better and that the nose bleeds were decreasing in frequency and quantity At the end of 1 month the patient was feeling well and could stand a moderate amount of trauma without subsequent ecchymosis At the end of the second month the patient felt normal It was also noted that she had a greater tendency to bleed when the expected menstrual flow would have appeared So it was thought safest to induce labor 2 weeks prematurely that is in the interval between two expected periods In attempt to induce labor by the use of 1 ounce of castor oil and 5 grains of quinine was unsuccessful The pregnancy was estimated to be at term November 22 1925 Gauze induction was tried November 6 and on November 7 a 10 centimeter bag was inserted The patient was delivered normally November 8 at 9 26 a m Less than a normal amount of bleeding took place The placenta was delivered normally after 1 cubic centimeter of pituitrin was given The puerperium lochia and temperature were normal (the temperature once rose to 99.4 degrees F the pulse to 104) The patient discharged 14 days postpartum stated that she had not felt as well since before the first baby was born The child was discharged in good condition weighing 2 900 grams

The incompatibility between the patient's and husband's bloods persisted indicating possibly that the protein to which it was necessary to immunize the patient might not have necessarily been the same one that caused the incompatibility However we want to place on record the treatment and its rationale of immunizing the patient against a possible harmful hereditary influence on the fetus from the paternal side This treatment is being extended to other toxemias of pregnancy

INTRADERMAL SALT SOLUTION TEST IN NORMAL AND TOXÆMIC PREGNANCIES

Dr Abraham F. Lash presented a paper on the Intradermal Salt Solution Test in Normal and Toxæmic Pregnancies a Diagnostic and Prognostic Aid (See p. 40)

Dr C. S. Bacon I would like to ask two questions The work is certainly interesting and may turn out to be quite valuable but there may be a number of factors concerned Dr Lash calls attention to the difference of disappearance time in negroes and whites and suggests that this may be due

to the difference in the thickness of the skin. Of course there is a difference in the thickness of the skin of white women. I wonder if that point was considered.

Is it possible to determine with accuracy the disappearance time so that if several people made the observation they would agree within any limits? Is there any other way of determining that besides by the touch? Would not use be made of the vision? I am thinking particularly of whether capillary microscopy might help.

Dr W. GEORGE LEE. Dr Lash should receive entire credit for this investigation and his results seem so worth while that further investigations in clinics are warranted. Certainly the procedure has the merit of simplicity which will make possible a very widespread check up of it. It is so new that I think none of us can say more than that it shows great promise and even in outside hospitals it can be used as a means of classifying beginning toxic conditions. It should be very helpful in a correct diagnosis of eclamptic and toxemic states in pregnant women.

Dr N. S. HEANEY. This work as outlined by Dr Lash is very interesting. I think he should receive a vote of thanks for presenting this paper to us. I was interested particularly to see how closely the test followed the clinical symptoms of blood pressure and urinary findings and as far as I could see there was no surprise in any of these cases. I would like to ask whether when a patient seemed to be progressing safely as far as blood pressure and urine were concerned he has ever found that according to this test the patient was not doing well.

Dr C. B. REED. Dehydration seems to be the one outstanding feature in these experiments but so far it has not been demonstrable. Possibly it can not be demonstrated.

Dr JOHN E. COOPER, Battle Creek, Michigan. While this study of the toxemia of pregnancy was being made, was anything noted in the early toxemias or the vomiting of pregnancy which might cause more marked dehydration than in the later toxemias? In my clinic we have been able to get practically all patients to come for prenatal work with great regularity. In all our toxemia cases we have found that the patients were definitely toxic in the very early stages when there was only a very small amount of albumin and the blood pressure was just beginning to rise.

Dr LASH (closing). My authority for the difference in the thickness of the skin in colored and

white women is Unna. That variation, however, would not make any difference in our test because, as I said, a 5 or 10 minute variation is of no consequence. As to the variation in readings made by different people it is true that when one makes a reading for the first time, the exact time of the disappearance of the wheel is not definite.

The technique of the test is simple, but a little practice in determining the end point is necessary.

Dr Heaney's question as to the value of the test can be answered by the results of my observations. First, there is a definite variation between toxemic and eclamptic and normal women, therefore it is a diagnostic aid. But further studies are necessary to determine whether these variations occur before blood pressure or urinary findings change. I can at present only state my findings. Very often we have a patient with a high blood pressure and abnormal urinary findings but with no subjective findings and yet we suspect a probable toxemia. My experience with this test has been this. When this hypertension and albuminuria are due to chronic nephritis the intradermal test is normal, while if they are due to toxemia the test shows a decrease in disappearance time. One of its values is to differentiate between true toxemia and this nephritic toxemia. Second, its prognostic value is demonstrated in 2 of our cases of eclampsia in which the disappearance was slow, indicating a subsidence of the toxemia. Death was due to bronchopneumonia. One other case showed no abnormalities in subjective or urinary findings, no edema, and a blood pressure of 160-90. The patient wanted to go home. This test showed a decreased disappearing time, about 30 minutes, which I call pathological. We kept her in the hospital until she was delivered. After delivery the disappearing time came back to normal. The value of the test in such a case is to know when to allow the patient to go home.

As to the dehydration, mentioned by Doctor Reed, I believe we have eliminated that factor as the short duration of the conditions could hardly produce a dehydration, in fact, 2 patients came in with convulsions. As to the vomiting of pregnancy, it is quite true that dehydration would occur and may have some influence on the test as suggested.

What I tried to bring out is that in these toxemias not only are the liver, kidney, and other organs involved, but all of the tissues of the body. We take advantage of the change in the skin.

Dr James T. Case, Battle Creek, Michigan, presented a paper (to appear in a later issue) on "The Early Diagnosis of Anencephalus."

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED BROWN M.D. F.A.C.S. OMAHA

THE GREAT WOUND SURGERY OF PARACELSUS

OCCASIONALLY an individual by his very personality achieves a remarkable prominence in his chosen field. This was true of Paracelsus who was probably the most picturesque medical figure of the sixteenth century and who, though his own reasoning and ideas were equally as erroneous as those of his predecessors, nevertheless overthrew the domination of Galenic medicine and brought medicine and surgery back to a more rational basis.

Phillipus Theophrastus Aureolus Bombastus von Hohenheim to give him his own and assumed names, proved the stormy petrel of medicine in central Europe of the sixteenth century. The son of a physician, William Bombastus von Hohenheim, he was born in Switzerland about 1493 and received his instruction first from his father, then from Eberhard Paumgartner and Matthaeus Scheyt and finally at the age of sixteen entered the University of Basel. When and if he graduated is not known, but after leaving the University he began to travel and covered much of Europe at times visiting the hospitals and at times serving as war surgeon in the Netherlands, Denmark, and Italy. He also visited Spain and the Orient. During this time he was constantly absorbing the then current surgical practice and forming his own opinions, which he was later to express most forcibly. He apparently read little, though in his work he refers to some of the older writers and evidently knew their ideas. One of his dicta was, "Reading never made a doctor but practice is what forms the physician." For all reading is a foot stool to practice and a mere feather broom.

In 1526 he returned to Germany and a year later became city physician in Basel and also professor of medicine and surgery at the University. Realizing as others had in England and France that many students did not understand Latin and Greek, he overthrew tradition and gave his instruction in the vernacular. Apparently his name of Bombastus was fitting for his utterances and writings are of the most egotistical and bombastic character. To show his utter contempt for the earlier writers he burned the works of Galen and Avicenna in his class room. He had, however, great respect for the works of Hippocrates and considered him the greatest physician of Greece, naively adding just as he, Paracelsus, was the greatest physician of Germany. He held the positions at Basel only two years and then was again on the wing, first in Alsace, then in Esslingen

and Nuremberg, always practicing constantly writing for he had published two medical treatises and if history is to be believed, always drinking, for he has the reputation of having been a most accomplished drunkard.

In 1531 he returned to Switzerland where he spent some years at St. Gall, Zurich, and other towns and then in 1536 at Ulm he published his *Great Surgery*, which he dedicated to King Ferdinand, the dedication being dated at Muenchenraht. He was not satisfied with this edition for in the same year another was printed in Augsburg by Heinrich Steyner, which Paracelsus saw through the press himself and this was his only surgical work. It was entitled *Der grossen Wundartzney* (*The Great Wound Surgery*) divided into three books. After the publication of this work he again took up his wanderings, apparently became little more than a drunken tramp and finally died in 1541 at the age of 48 years.

The first impression is that there is little in Paracelsus' surgery and looked at from one angle this is true, so it seems hard to explain the man's great vogue. On further study, however, the reason seems fairly clear, especially when one compares the cause of the great success of Paré. It was the usual practice in the early sixteenth century to irritate wounds with constant dressings and continual application of caustics, one of the favorites being boiling oil to promote suppuration. Paracelsus attacking surgery *de novo*, cast all precedent to the winds and announced the dictum that there was in the tissues themselves a healing balsam, which he called animal mummy and which was added by cleanliness of the wound and some soothing chemical applications but not by irritating caustics and boiling oil. This policy of letting wounds alone must have greatly increased his good results over those of the surgeons of his day and seems to be at least a plausible reason for his great success. In addition Paracelsus, though not regularly graduated in medicine, was well grounded in chemistry and believed that chemicals should be used as medicines. Hence many of his wound dressings were antiseptic and these, added to his constant insistence on cleanliness, aided his results.

The illustrations in the book are mostly borrowed from the *Surgery* of Hieronymus Brunschwig, Strassburg, 1497, but the one reproduced here is an original and one of the first, if not the first, illustration of firing a cannon.

*Courtesy of Dr. Le Roy Crummer, Omaha, Nebraska.

Das erst Buch/der grossen
Das Achte Capitel/Vom brand des puluers/
 von püchssen des salniters/des schwefels/des aquasorts/oder
 schadwassers/oder ander dergleychen
 Alchimistisch zůfall.



Dieser brand ist ein eintringender brand/der in im selbs ein gross merck
 liche hitz faßt/vnd hat vñ nit bald/sonder langsam erkaltet. vñ wa
 er anhaßte da klee er starck an/dañ der schwebel vñ niter lassen nit
 nach/bis sie gar verzert sind/aufgenommen der brand vom himel/sonst ist kein
 hitz vber dise hitz vñ brand/also auch die starcken wasser/so von Alchimistē ge
 macht werden/Die selbigen sind auch in der grösste bößheit/nit allein der hyn
 balben/sonder auch der grossen Coitossischen art/so sie nit einfärē/als dañ
 inn

REVIEWS OF NEW BOOKS IN SURGERY

THE professor of Oto-laryngology, and the chief of the clinic at Strasbourg University have given us a full and valuable treatise¹ on the important subject of the sphenoid sinus. It is designed as a practical guide to the specialist and emphasis is laid on the anatomy, the radiography, the method of exploration, and the endonasal surgical technique. It is essentially a practical treatise and as such it can be warmly recommended. At a time when so much attention is directed toward the nasal sinuses in children it is well to have an account so clear and full as that here given. Though the sphenoidal sinus is outlined in intra uterine life, its development is slow and at the end of the third year its average dimension is only 6 millimeters. Before the age of 12 the cavity occupies only the antero-inferior part of the sphenoid. From this age its development is more rapid, so that at the age of 14 the sinus may fill a large part of the body of the sphenoid. The position of the ostium varies; it is not always symmetrical and is frequently concealed in the sphenoid-ethmoid recess.

The sphenoid sinus is a closed cavity, badly drained and ventilated, in which chronic suppuration is often revealed on postmortem examination, and disease in this area readily extends to adjacent parts. We have not yet definitely settled the rôle it plays in retrobulbar neuritis and "sphenoidal" headaches. Further, when the cavity is large, the relation of its posterior wall to the brain is a possible cause of meningitis and a likely explanation of the headaches, vertigo, and vomiting of sinus trouble. Nevertheless the sphenoidal sinus has had less surgical attention paid to it than its clinical significance demands. The reason for this neglect is apparent when we consider its anatomical position and the difficulty of approach.

The symptomatology of sphenoid disease, as the writers point out, is indefinite and vague. The history is of value. For example, pain in the occipital region, or at the base of the brain or behind the eyes, following a coryza accompanied by blocking of the nose, suggests a sphenoid involvement. Many nasopharyngeal catarrhs which resist treatment are due to sphenoid trouble. But the history and the symptoms are often so vague that one has to depend for diagnosis on exploration with the speculum or pharyngoscope, by posterior rhinoscopy, catheter puncture, etc. Preceding this examination cocaine adrenalin application should be made well back into the sphenoid-ethmoid recess for from 10 to 15 minutes. Normally the anterior wall of the sphenoid is free from the end of the middle turbinate, the absence of this free space the authors regard as pathognomonic of sphenoid trouble. Catheterization is difficult, for normally the ostium cannot be seen, so one has often to resort to puncture. Puncture is a slight operation

when properly done and gives information of value. It ought to be carried out under direct examination with recognition of the dangers and with a knowledge of the most suitable method. In puncture the dangerous regions are above and external—above the septum is thick and external is the optic nerve.

In a brief review it is impossible to refer to the many practical points which the authors deal with. This volume contains many precise data which the rhinologist desires and cannot readily obtain. More over it is based on the experience of two rhinologists who are recognized authorities on this subject.

J. GORDON WILSON

BASED on 153 personal cases and an exhaustive review of the literature, Spinelli has written a monograph² which covers in a masterly way the entire subject of myofibromatoma of the uterus. Part I deals with present day clinicophysiological notions which form the basis of actinotherapeutic treatments. Part II is taken up with a discussion of the radiosensitivity of uterine fibromyomata. Spinelli believes that the uterus is at least as radiosensitive as are the ovaries or testicles, therefore, any tumor developing in the uterus must be equally radiosensitive. Among the possible dangers of actinotherapy Spinelli mentions leucopenia, fever which may be either immediate or remote, artificial menopause, fetal deformities in pregnancies following irradiation, intestinal lesions, infections of the uterine mucosa following the introduction of radium tubes in the uterine cavity, and stenosis or atresia of the cervix from the same cause. Spinelli states that the mucosa of the digestive tract is very vulnerable to the X ray and advises the use of the Trendelenburg position in order to remove viscera from the field of irradiation. The possibility of cancer or sarcoma is also mentioned, although Spinelli looks upon such case reports as pure coincidences. His indications for actinotherapy are, in general, the corresponding surgical contra-indications, such as extreme anemia, hyperthyroidism, diabetes, persistent thymus, etc. Among the contra-indications he lists pregnancy, reproductive age of patient, coexisting adnexal tumors, acute pelvic infections and in general, malignancy. Regarding his technique, Spinelli very properly states that he has none, but adopts the treatment to the individual case. This fact is brought out in the last chapter which gives a detailed account of the treatment given in each of his personal cases. This is a most valuable monograph for both the roentgenologist and the clinician.

GEORGE DE TARNOWSKY

WITH the intent of presenting a concise and comprehensive review of the present knowledge of scoliosis, Samuel Kleinberg furnishes us with

¹ LE SINUS SPHÉNOÏDAL. By G. Canuyl and J. Terracol. Paris: Masson et Cie. 1915.

² L'ACTINOTERAPIA NEI MIOFIBROMI UTERINI. Prof. Mamele Spinelli. Naples: Vittorio Idelson. 1915.

a splendid volume! Although the book is primarily for orthopedists its easy style and logical arrangement will lend to its popularity with general practitioners. Scoliosis when recognized early may be cured completely and this monograph will help open many eyes to diagnosis of incipient cases. The chapters on etiology, pathology and classification are thorough and form the backbone of the work. Treatment including operative treatment with its indications is clearly outlined. The reviewer believes that this volume should be in the hands of every family doctor, school nurse and social service director. Thus many human social and scoliotic misfits may be saved from unhappy existences.

KELLOGG SPEED

¹SCOLIOSIS, ROTARY LATERAL CURVATURE OF THE SPINE. By S. M. L. N. H. M. D. F. A. C. S. N. W. Y. L. P. I. Hoebe. 1926.

THE constant iteration of homely truths concerning early active movement after fracture² cannot be too frequently impressed on the practitioner. In a too brief exposition of the subject Dowden advocates the use of active motions early and constantly to shorten the period of inactivity and to lessen the degree of disability. The body of the work is composed of excellent illustrations showing end results. Little attention is paid to reduction and splinting *per se* movement alone is required. The average American reader will feel that more attention should be paid to reduction but he may well take the lesson taught by the advocates of early movement.

KELLOGG SPEED

THE PRINCIPLE OF EARLY ACTIVE MOVEMENT IN TREATING FRACTURES OF THE UPPER EXTREMITY. By J. W. Dowden. Edinburgh: Oliver & Boyd, 1924.

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

A CLASSIFICATION OF THE TUMORS OF THE GLIOMA GROUP ON A HISTOGENETIC BASIS WITH A CORRELATED STUDY OF PROGNOSIS. By Percival Bailey and Harvey Cushing. Philadelphia: J. B. Lippincott Company, 1926.

THE PRIVATE PRACTITIONER A PIONEER IN PREVENTIVE MEDICINE BEING THE ANNUAL ORATION OF THE HUNTERIAN SOCIETY. 1926. By Sir George Newman. K. C. B. M. D. D. C. L. London and New York: Oxford University Press, 1926.

AN INTRODUCTION TO THE STUDY OF X RAYS AND RADIUM. By Hector A. Colwell. M. B. (Lond.) D. P. H. (Oxf.) and Cecil P. G. Wakeley. F. R. C. S. (Eng.) F. R. S. (Edin.) London and New York: Oxford University Press, 1926.

THE DIAGNOSIS, TREATMENT AND END RESULTS OF TUBERCULOUS DISEASE OF THE HIP JOINT. By George Perkins. M. Ch. (Oxon.) F. R. C. S. (Eng.) London and New York: Oxford University Press, 1926.

NEURITIS AND NEURALGIA. By Wilfred Harris. M. D. (Cantab.) F. R. C. P. (Lond.) London and New York: Oxford University Press, 1926.

DISEASES OF THE NEW BORN. By John A. Foote. M. D. Philadelphia: J. B. Lippincott Company, 1926.

CONTRIBUTIONS TO OPHTHALMIC SCIENCE. Dedicated to Dr. Edward Jackson in Honor of his Seventieth Birthday. By His Pupils and Colleagues. Menasha, Wisconsin: George Banta Publishing Company, 1926.

A TEXT BOOK OF MIDWIFERY FOR MEDICAL SCHOOLS AND COLLEGES IN INDIA. By Kedarnath Das. C. I. E. M. D. Calcutta: Thacker, Spink & Company, 1926.

EMERGENCY SURGERY THE MILITARY SURGERY OF THE WORLD WAR ADAPTED TO CIVIL LIFE. By George de Tarnowsky. M. D. F. A. C. S. D. S. M. Philadelphia: Lea & Febiger, 1926.

TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION. Vol. XLII. Edited by John H. Jopson. M. D.

LA GASTROSCOPIE. ÉTUDE CLINIQUE ET EXPÉRIMENTALE. By Docteur Jean Rachet. Paris: Octave Doin, 1926.

BIOLOGIE UND PATHOLOGIE DES WEIBES. EIN HANDBUCH DER FRAUENHEILKUNDE UND GEBURTSHILFE. Edited by Josef Halban and Ludwig Seitz. Die operative Geburts-

hilfe by Geh. Med. Rat. Prof. Dr. G. Winter. Berlin: Urban & Schwarzenberg, 1926. Lieferungen 23 and 24.

BERNHARD HERTZES VERSUCH EUBER KNOCHENREGENERATION SEIN LEBEN UND SEINE ZEIT. Prepared by Dr. K. Vogeler. Dr. E. Redenz. Dr. H. Walter. Prof. Dr. B. Martin and preface by Professor Dr. A. Bier. Berlin: Julius Springer, 1926.

THE INTERNATIONAL MEDICAL ANNUAL. Vol. XLIV. New York: William Wood and Company, 1926.

CHIRURGIE DU SYMPATHIQUE. CHIRURGIE DU TONUS MUSCULAIRE. LA SECTION DES RAMEAUX COMMUNICANTS. By P. Wertheimer and A. Bonniot. Paris: Masson et Cie, 1926.

LES PROBLÈMES DE LA PHYSIOLOGIE NORMALE ET PATHOLOGIQUE DE L'ŒIL. By R. Lenche and A. Policard. Paris: Masson et Cie, 1926.

THOMAS SYDENHAM CLINICIAN. By David Reisman. M. D. New York: Paul B. Hoeber, 1926.

THE PRINCIPLES OF ANATOMICAL ILLUSTRATION BEFORE VESALIUS. By Fielding H. Garrison. A. B. M. D. New York: Paul B. Hoeber, 1926.

A BIPOLAR THEORY OF LIVING PROCESSES. By George W. Cnle. New York: The Macmillan Company, 1926.

HERZKRANKHEITEN BEI FRAUEN. By Prof. Dr. N. Jagic. Berlin: Urban & Schwarzenberg, 1926.

NEUE KLINISCHE GESICHTS PUNKTE ZUR LEHRF. VON ASTHMA CARDIALE. By Dr. Sigmund Wasseimann. Berlin: Urban & Schwarzenberg, 1926.

THE THYROID GLAND. By Prof. Charles H. Mayo and Prof. Henry W. Mummet. St. Louis: The C. V. Mosby Company, 1926.

FEDERAL NARCOTIC LAWS A DIGEST AND AN EDITORIAL ARTICLE. Published by Los Angeles County Medical Association.

PEDIATRICS. Edited by Isaac A. Abt. M. D. Vol. VIII. Also under vols. I-VII. Philadelphia: W. B. Saunders Company, 1926.

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION. Vol. XVII. 1923. Philadelphia: W. B. Saunders Co., 1926.

SURGICAL ANATOMY OF THE HUMAN BODY. By John B. Deaver. M. D. Sc. D. LL. D. F. A. C. S. 2d ed. Vol. I. Philadelphia: P. Blakiston's Son & Company, 1926.

A TEXT BOOK OF UROLOGY. By Oswald Swinney. Lowry. A. B. M. D. F. A. C. S. and Thomas Joseph Kirwin. Ph. C. B. S. M. A. M. D. Philadelphia: Lea & Febiger, 1926.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

RUDOLPH MATAS, New Orleans, *President*

WALTER W CHIPMAN, Montreal *President Elect*

FRANKLIN H MARTIN Chicago *Director General*

MONTREAL COMMITTEE ON ARRANGEMENTS

ALFREDO T BAZIN, *Chairman*

EDWARD B CHANDLER, *Secretary*

WALTER W CHIPMAN

A MACKENZIE FORBES

ALBERT LASSALLE

EUGENE SAINT JACQUES

EDMOND M EBERTS

FRASER B GURD

DAVID W MACKENZIE

WILLIAM G TURNER

ALFRED FERROU

STEPHEN LANGEVIN

OSCAR F MERCIER

PLANS FOR THE CLINICAL CONGRESS IN MONTREAL

FOR the sixteenth annual Clinical Congress of the American College of Surgeons to be held in Montreal, October 25-29, 1926, the Committee on Arrangements is preparing a program of clinics and demonstrations that will adequately represent the clinical activities of Canada's great medical center. The program, as herein published, is a tentative outline and is to be revised and amplified during the coming months as the work of the Committee progresses. All departments of surgery will be represented therein, including general surgery, gynecology, obstetrics, orthopedics, urology, surgery of the eye, ear, nose, and throat.

Since 1920 a number of hospitals have been built and additions made to the older hospitals so that clinical facilities of Montreal have been very greatly increased. Clinics and demonstrations are to be given in the following institutions: McGill University and University of Montreal medical schools, the Children's Memorial, Hotel Dieu, Misericordia, Montreal General, Notre Dame, Royal Victoria, St. Justine, and Shriners' Hospitals. Those who attended the 1920 session of the Clinical Congress in Montreal will recall with pleasure the splendid clinical program offered, and it may be confidently expected that this year's meeting will provide a larger and still more interesting series of clinics.

Scientific meetings will be held each evening in Windsor Hall, at the Windsor Hotel, the programs for which are being prepared by the Executive Committee of the Clinical Congress. Eminent surgeons of the United States and Canada and

number of distinguished surgeons from abroad will present papers dealing with important surgical questions.

At the Presidential Meeting, the first formal session of the Congress, to be held on Monday evening in Windsor Hall, Dr. Walter W. Chipman, President Elect, will be inaugurated and deliver the annual address. The sixteenth annual convocation of the College will be held on Friday evening in Windsor Hall, when the 1926 class of candidates for Fellowship in the College will be received.

HOSPITAL CONFERENCE

The first two days of the Congress will be devoted to conferences on the problems related to the hospital standardization program of the College and will be of particular interest to surgeons, hospital trustees, executives and personnel generally. These conferences will be held in Windsor Hall. A program is in preparation and will be published at an early date.

A hospital information and service bureau, to give assistance to hospitals in the solution of their problems, will be maintained at headquarters throughout the session. An invitation is extended to all persons interested in the hospital field to attend these conferences.

HEADQUARTERS AND HOTELS

General headquarters for the Congress will be established at Windsor Hotel on Dominion Square. This hotel is now under the same management as the Waldorf-Astoria in New York, the Bellevue Stratford in Philadelphia and the New Willard in

Washington More than a million dollars has been expended in recent years in remodeling and enlarging the hotel Windsor Hall, Rose Blue and Oak rooms and other large rooms and lobbies located on the ground floor have been reserved for the exclusive use of the Congress

Ample and comfortable accommodations for 3,000 people have been assured by the managers of the several Montreal hotels. A new hotel, the Mount Royal located on Peel Street, two blocks north of the Windsor Hotel, has upwards of 1000 rooms. Accommodations have also been reserved at the Queen's Hotel located near the Bonaventure Station which has been recently remodeled and a new section added, doubling its capacity at the Ritz Carlton corner of Mountain and Sherbrooke Streets and at the Corona on Guy

Street and the Place Viger—all within short walking distance of headquarters except the latter hotel

Montreal Hotel Rates	Minimum Rates	
	Single Room	Double Room
Windsor with bath	\$4 00	\$7 00
with running water	3 00	5 00
Mount Royal with bath	4 00	7 00
Ritz Carlton with bath	6 00	10 00
Queen's with bath	4 00	6 00
with running water	2 50	5 00
Place Viger with bath	4 00	8 00
without bath	3 00	5 00

An application for reduced fares on account of the meeting in Montreal is pending with the railways of the United States and Canada and it is practically assured that a rate of one and one half the regular one way fare on the certificate plan will be authorized for this meeting

PRELIMINARY CLINICAL PROGRAM—GENERAL SURGERY, GYNECOLOGY, OBSTETRICS, ORTHOPEDICS, UROLOGY

MONTREAL GENERAL HOSPITAL

Tuesday

- H M LITTLE—9 Operations Ectopic gestation pelvic inflammations
 F J TEES—9 Demonstration Injury to elbow with late ulnar nerve lesion (5 cases)
 E M EBERTS—10 Demonstration Unusual types of thyroid disease two cases of acute traumatic tension pneumothorax
 F J TEES and F B GURD—10 Fracture clinic
 A T BAZIN—10 30 Operations Gall bladder disease carcinoma of rectum
 L J RHEA and associates—10 30 Clinical pathological conference
 J G W JOHNSON—11 Cranial injuries
 J A NUTTER—Orthopedic clinic operations for paralytic deformities
 F J TEES and F B GURD—2 Fracture clinic
 L H McKIM—3 Operative treatment of infections and compound injuries of hand and upper extremity

Wednesday

- F S PATCH and R E POWELL—9 Operations Prostatectomy nephrectomy
 F J TEES—9 Demonstration Fractures of ankle and wrist
 A T BAZIN—10 Demonstration Suppurative joint lesions
 F J TEES and F B GURD—10 Fracture clinic
 E M EBERTS—10 30 Operations Radical cure of inguinal hernia by infolding, muscular suture under local anæsthesia excision of carcinosarcoma
 L J RHEA and associates—10 30 Clinical pathological conference
 C K P HENRY—11 Demonstration End results of splenectomy in pernicious anemia
 J A NUTTER—2 Orthopedic clinic operations for congenital deformities
 F J TEES and F B GURD—2 Fracture clinic
 W L BARLOW—3 Operations Excision of tongue for carcinoma

Thursday

- H M LITTLE—9 Gynecological operations for repair of birth injuries
 F B GURD—9 Demonstration Fractures of femur and patella
 L H McKIM—10 Demonstration Wound infection in appendicitis
 F J TEES and F B GURD—10 Fracture clinic
 A T BAZIN—10 30 Operations Radical cure of hernia by fascial graft carcinoma of colon
 L J RHEA and associates—10 30 Clinical pathological conference
 J A NUTTER—11 Demonstration Backache sciatica sacro iliac and lumbosacral lesions and podylithesis

Friday

- F S PATCH and R E POWELL—9 Urological operations
 A T BAZIN—9 Demonstration Bone tumors
 F J TEES and F B GURD—10 Fracture clinic
 E M EBERTS—10 30 Operations Thyroidectomies
 L J RHEA and associates—10 30 Clinical pathological conference

WESTERN DIVISION

- F B GURD and associates—9 daily General surgical and gynecological operative clinics
 F B GURD and associates—2 daily Demonstrations of end results on fractures of the ankle tibia and fibula femur humerus etc

MISERICORDIA HOSPITAL

- STEPHEN LANGEVIN E ETHER D MASSON A RICARD H SANCHE P GAUTHIER H LeBELL and DR JUTRAS—daily Obstetrical clinics, operations and demonstration of cases control of eclampsia convulsions by intravenous injection of sulfamides pernicious anemia and transfusion pernicious vomiting and blood group Hirudo medicinalis (leeches) in femoral thrombophlebitis how to treat the child in breech extraction white asphyxia and cerebral injury

ROYAL VICTORIA HOSPITAL

Tuesday

- E W ARCHIBALD and staff—9 General surgical clinic
D W MACKENZIE and staff—9 Urological clinic, operations and demonstration of cases

Wednesday

- C B KEENAN and staff—9 General surgical clinic
W G TURNER and W J PATTERSON—9 Orthopedic clinic, operations and demonstration of cases

Thursday

- I A C SCRIMGER and staff—9 General surgical clinic
D W MACKENZIE and staff—9 Urological clinic, operations and demonstration of cases

Friday

- F C MCKENTY and staff—9 General surgical clinic
W G TURNER and W J PATTERSON—9 Orthopedic clinic operations and demonstration of cases

ROYAL VICTORIA HOSPITAL—MONTREAL MATERNITY PAVILION

Tuesday

- W W CHIPMAN and H M LITTLE—9 Gynecological and obstetrical clinic, operations and demonstration of cases

Wednesday

- H C BURGESS and J R FRASER—9 Gynecological and obstetrical clinic, operations and demonstration of cases

Thursday

- J R GOODALL and J W DUNCAN—9 Gynecological and obstetrical clinic, operations and demonstration of cases

Friday

- W W CHIPMAN and W A G BAULD—9 Gynecological and obstetrical clinic, operations and demonstration of cases

ROYAL VICTORIA HOSPITAL—PATHOLOGICAL INSTITUTE

Wednesday

- E H MASON—9 Pre-operative preparation of the diabetic patient with discussion of so called "diabetic gangrene"
J C MEAKINS—9 Medical indications for splenectomy. Respiratory abnormalities in regard to the operative risk.
D S LEWIS—9 Relation of hypertension to surgical risk.
C F MORFATT—9 Relation of cardiac disease to surgical operative risk

Thursday

- DAVID BALLON—9 The bronchoscopic injection of lipiodol as an aid to X ray diagnosis of pulmonary lesions. Combined bronchoscopic and X ray demonstration
A H PRIE—9 Demonstration of lungs injected with lipiodol in bronchiectasis and other diseases. Normal abnormalities of bones
E C BROOKS—9 Report on 100 cases in which tetraiodophenolphthalein was given by mouth with operative and other findings

Friday

- E W ARCHIBALD, F A C SCRIMGER, D ROSS GAVIN MILLER, JOHN ARMOUR—9 Experimental surgery

HOTEL DIEU HOSPITAL

Tuesday

- PIERRE Z RHEAUME and JOSEPH A ST PIERRE—9 Surgical operations. Appendicitis chronic and possibly acute, cholecystectomy, entero anastomosis, fracture of the femur, fracture of the tibia, Delbet's walking splint, hysterectomy
EUGENE ST JACQUES, DONALD A HINGSTON and WILLIAM J DEROME—2 Clinical demonstration. Trauma of the hip, heliotherapy in the treatment of osseous tuberculosis as practiced at Leysin and Davos, Switzerland, pituitary gland clinical pathology, limited indications and multiple contra indications of uterine curettage
LEO PARIZEAU—2 X ray demonstration

Wednesday

- EUGENE ST JACQUES, DONALD A HINGSTON and WILLIAM J DEROME—9 Surgical operations. Demonstration of the advantages of the Reverdin needle and self retractors in diminishing the number of assistants. Hysterectomy for fibroma, hysterectomy for salpingo-ovariitis, thyroidectomy, cholecystectomy, fracture of the patella. Delbet's method
PIERRE Z RHEAUME, JOSEPH A ST PIERRE and Professor BARRI, biochemist—9 30 Clinical demonstration. In testinal tuberculosis, stricture of the oesophagus, ovarian conservation, uterine fibroma and pregnancy, thyroid pathology, some chemical aspects of splenomegaly, value of the Ambard test in estimating the kidney function

Thursday

- EUGENE ST JACQUES, DONALD A HINGSTON and WILLIAM J DEROME—9 Surgical operations. Appendicitis, cholecystectomy, gastro enterostomy, hysterectomy, thyroidectomy, starch bandages in trauma of the forearm. Delbet's walking splint in fracture of the leg

Friday

- PIERRE Z RHEAUME and JOSEPH A ST PIERRE—9 Surgical operations. Prostatectomy, stone in the bladder, intestinal resection, nephropexy, nephrotomy for stone in kidney, hysterectomy, appendicectomy

NOTRE DAME HOSPITAL

Tuesday

- O F MERCIER, U GARIÉPY and L BLAGDON—9 Fracture clinic, presentation of a personal technique and instrument for temporary metallic osteosynthesis, demonstration and report of cases
T PARIZEAU, J A DEMERS, and O A GAGNON—9 Surgery of the gall bladder, operations and demonstration of specimens
L DE L HARWOOD A ETHIER, R TRUDEAU, H AUBRY, and L GÉRIN LAJOIE—9 Gynecological clinic operations and demonstration of cases
E A RENÉ DE COTRET and staff—9 Obstetrical clinic, puerperal infection bedside work, demonstrations
J A PANNETON—9 X ray demonstration, routine work with exhibition of special technique and films. Iodikon in gall bladder diseases, lypiodol in bronchial and lung diseases
DR BELLEROSE and staff—9 Routine work of outpatient department
NOÉ FOURNIER—9 Urological outpatient clinic

Wednesday

- L DE L HARWOOD A ETHIER, R TRUDEAU, H AUBRY and H GÉRIN LAJOIE—9 Gynecological clinic

- F G BOURGEOIS and O MERCIER JR—g Urological operations suprapubic cystostomy and prostatectomy, also thesis in urology
- E A RENÉ DE CORRET and staff—g Obstetrical clinic
- O F MERCIER U GABRIEL and L BLAGDON—g Traumatic clinic, demonstration of apparatus on different cases
- J A PANVETON—g X ray demonstration routine work with exhibition of special technique and films Iodikon in gall bladder diseases lypodion in bronchial and lung diseases
- Dr BELLEROSE and staff—g Routine work of outpatient department
- Noé FOURNIER—g Urological outpatient clinic
Thursday
- L PARIZEAU C A GAGNON and J A DEMERS—g Surgical operation Gastro enterostomy appendectomy
- L DE L HARWOOD A EYRIE R TRUDEAU H AUBRY and L GERR LJOYE—g Gynecological clinic
- B G BOURGEOIS and O MERCIER JR—g Importance of the catheterization of the ureters in the exploration of renal function demonstration of cases
- O F MERCIER U GABRIEL and L BLAGDON—g Abdominal troubles in stasis of right hemi-colon Operations Sympathectomy blood transfusion
- J N ROY—g Dry clinic plastic surgery
- J A PANVETON—g X ray demonstration routine work with exhibition of special technique and films Iodikon in gall bladder diseases lypodion in bronchial and lung diseases

- Dr BELLEROSE and staff—g Routine work of outpatient department
- Noé FOURNIER—g Urological clinic outpatient department

CHILDREN'S MEMORIAL AND SHRINERS HOSPITALS

- A MACKENZIE FORBES and staff—10 daily Operations Harleip cleft palate hernia, tendon transplantation Demonstrations Reduction of congenital dislocation of the hip correction of deformities due to club feet correction of deformities due to rickets sequestrectomy Application of extensions in fractures and tuberculosis of the hip Demonstration of routine examination of children suffering from tuberculosis of bones and deformities following acute anterior poliomyelitis O steomyelitis (lantern slide demonstration) Scoliosis and its treatment Preparation of plaster bandages and demonstration of their proper application

SAINT JUSTINE HOSPITAL

- DES FAERON CHÉPAULT DUBÉ and RIVARD—daily Operative clinics and demonstration of end results general surgery in children harleip undescended testicle prolapse of rectum congenital hernia, spina bifida curvature of the spine and l oit s disease
- A COMTOIS—daily X ray demonstrations

SURGERY OF THE EYE, EAR, NOSE, AND THROAT

ROYAL VICTORIA HOSPITAL

Tuesday

- DAVID H. BALLOU—1 Use of lipiodol in pulmonary diagnosis by the bromo-oscopic method lantern demonstration
- WILLIAM J. McNALLY—2 Experimental work on labyrinth with clinical application
- G EDWARD TREMBLE—2 Nasal prosthesis
- Staff—1 Eye clinic slit lamp demonstration

Wednesday

- E HAMILTON WHITE—2 Tonsillectomy with demonstration of intratracheal anesthesia
- J T ROGERS—2 Immediate skin graft in radical mastoid radical maxillary sinus operation under local anesthesia
- A G McALLISTER—2 Cryptic intra-ocular sarcomata lantern slide demonstration
- J A MacMILLAN—2 Wound infections of the eyeball lantern slide demonstration

Friday

- 1 of H S BIRKETT E H WHITE J T ROGERS D H BALLOU G E TREMBLE A HURCHISON WILLIAM J McNALLY—2 Ear nose and throat clinics operations and demonstrations of cases
- Staff—2 Eye clinic slit lamp demonstration

NOIRE DAME HOSPITAL

- A A FOLCHER J N ROY J A ST DENIS L FOLCHER E PANVETON and J BRALLET—g daily Eye ear nose and throat clinics Plastic surgery of the face Tonsillectomy under local anesthesia Operations and demonstration of cases

HOTEL DIEU HOSPITAL

Tuesday

- ALBERT LASALLE—2 30 Dacryocysto rhinostomy (Dupuy Dutemps technique) operation followed by demonstration with lantern slides
- F BADAURE—2 30 A rare case of conjunctivitis with discussion

Wednesday

- J P E BOLSAQUET—2 30 A new method of operation on the frontal and ethmoidal sinuses operation under local anesthesia
- G BADAURE—2 30 Twenty cases of thrombophlebitis of the jugular vein with discussion

Friday

- ALBERT LASALLE—2 30 Reconstruction of the lachrymal ducts by derma-epidermic graft demonstration with lantern slides
- J P E BOLSAQUET—2 30 Ocular muscular imbalance demonstration with living cases

MONTREAL GENERAL HOSPITAL

- G H MATHEWSON and S H McKEE Eye clinics operations and demonstration of cases
- A E LUNDYON Plastic nasal repairs
- H BABY Zinc ionization in chronic otorrhoia
- A W TURNES Biliary chair tests
- G E HODGE Bronchoscopy
- J B GALLAGHER Brain abscess
- A O FREEDMAN Salivary gland tumor
- A HENRY Ear nose and throat clinic
- C J STEWART Ear nose and throat clinic

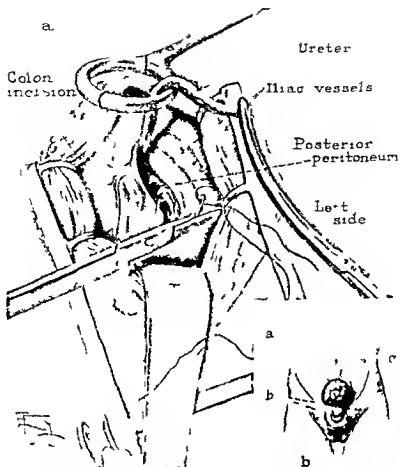


Fig. 3. Ureter elevated from its bed and peritoneum being sutured to cover the raw areas. / Incisions for transplanting ureters

Exstrophy of the Bladder — Charles H. Mayo and William A. Hendricks

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XLIII

AUGUST 1926

NUMBER 2

EXSTROPHY OF THE BLADDER¹

By CHARLES H. MAYO M.D. I.A.C.S. and WILLIAM A. HENDRICKS M.D. ROCHFESTER MINNESOTA
Fellow in Surgery, The Mayo Foundation

EXSTROPHY of the bladder occurs according to Spooner four times in 116,000 births and according to Neudoerfer, once in 50,000 births. It has been observed in 95 instances in the Mayo Clinic since 1901.

Statistics show that 50 per cent of all persons afflicted with exstrophy are dead by their tenth year, and that 66.67 per cent are dead by their twentieth year. Other defects associated with exstrophy are hydrocephalus, spina bifida, hare lip, imperforate anus and epispadias (Figs. 1 and 2). Relaxation and prolapsus of the sphincter ani is often associated and must be excluded before surgical intervention, as their presence is a serious menace to urinary control by rectum. The pubic arch is incomplete anteriorly, and hernia on one or both sides is often an accompanying defect. The umbilicus is lower on the abdomen than is usual, often encroaching on the mucosa of the upper part of the bladder. The deaths are usually due to nephritis which not infrequently accompanies contracture of the lower end of the ureter and thus causes hydro-ureter and hydronephrosis to become pyonephrosis.

The history of surgery as applied to this condition is interesting. Very early the idea of bringing about a cloacal condition such as exists in birds was attempted by transplanting the ureters into the intestines. The first attempt toward this end was made by Simon

in 1831. From time to time attempts have been made to form a bladder by plastic procedures. With this type of operation such names as Roux, Thiersch, Wood, Kanavel, Trendelenburg, Koenig and Albarron are linked.

Maydl in 1896 transplanted intraperitoneally into the sigmoid the base of the inverted bladder with the attached ureters. Moynihan in 1906 modified the Maydl operation, making it an extraperitoneal one by transplanting a larger inverted section of the bladder into an opening in the anterior wall of the rectum.

Coffey has demonstrated that the common duct of the liver like the salivary ducts and ureters passes through the muscularis and continues for some distance between the mucous membrane and the firmer outer wall of the cavity. Thus pressure from within compresses the ducts and blocks dilatation and ascending infection. It is this principle of Coffey's that has been used in the clinic in recent years. The most satisfactory operation for exstrophy of the bladder, if the ureters are normal, is to unite the right ureter with the rectosigmoid and the left ureter with the upper sigmoid.

The technique generally followed in the clinic today is as follows. A lateral incision, 10 centimeters long, is made and the ureter is located in the pelvis behind the peritoneum (Fig. 3). The definition and location of the ureter are aided by stroking the peritoneum,

¹Submitted for publication April 22, 1926.

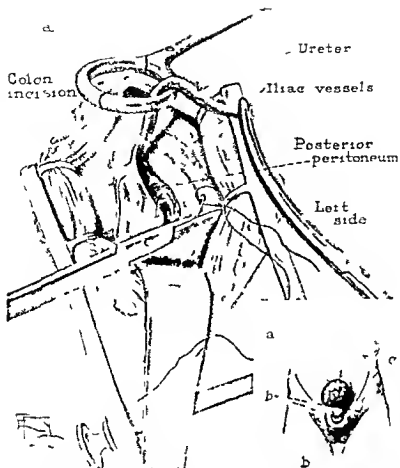


Fig. 3. Ureter elevated from its bed and peritoneum being sutured to cover the raw area. T Incision for transplanting ureter

Lxstrophy of the Bladder —Charles H. Mayo and
William A. Hendricks



Fig 4 The ureter being drawn into the bowel by needle and thread. The thread is advanced into the ureter about 3 or 5 centimeters

ureter to fix its position in the longitudinal bed made for it. A continuous row of sutures makes additional protection over the line of the interrupted sutures (Fig 5). Two or three additional sutures fix the bowel to the parietal peritoneum to cover and avoid kinking of the ureter and to prevent any traction on it. By this method the ureter is incorporated in the bowel wall for a distance of about 2.5 to 3.75 centimeters. Any internal pressure closes the ureter but does not prevent normal intermittent emptying of the ureter by peristalsis. The second operation, transplantation of the left ureter, is carried out in from 10 to 14 days which permits sufficient time for the right transplanted ureter to function fully and allows for the interval during which mild symptoms of pyelonephritis usually occur.

The most favorable age for the operation for exstrophy of the bladder is between 4 and 10 years. Older persons have been operated on successfully but dilatation of the ureter is more common in them and if both ureters are dilated operation is inadvisable. To determine the condition of the ureters before

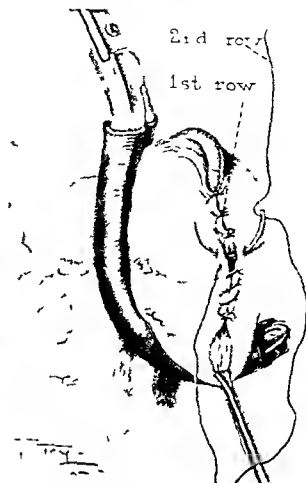


Fig 5 Closing the muscle and omentum over the ureter

operation it is sometimes advisable to inject them with sodium bromide and take a roentgenogram. By this means information may be gained which would save unnecessary exploration if they are greatly enlarged. As a palliative measure under these circumstances meatotomy could be performed on the ureteral orifices presenting at the bladder to overcome the stricture at this point and to establish better drainage of the ureters.

Recently Coffey described a technique for simultaneous implantation of the right and left ureters into the pelvic colon which does not obstruct the ureters nor disturb renal function (Fig 6). In this operation tubes are used to transmit the urine through the oedematous bowel tissue surrounding the anastomosis. The left ureter is exposed first and to its proximal end is fastened a rubber tube of very fine bore and 2 or more feet in length. The thread fastening the tube into the ureter is tied sufficiently tight to control the urine and later to cause sloughing of the tied end. The

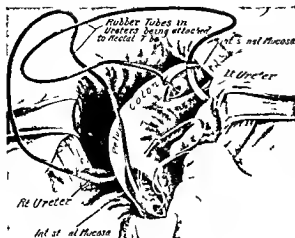


FIG. 6 Simultaneous implantation of right and left ureters (Coffey)

right ureter is then exposed and treated likewise

Then both ureters and tubes are drawn into the lumen of the bowel through previously prepared incisions in the wall of the latter and attached to a rectal tube which has been inserted in the rectum at the beginning of the operation. The wall of the bowel is prepared and the closure over the ureter carried out in the manner previously described. The tubes protruding from the rectum are cut to the proper length and placed in a container for the urine. They come away in about a week.

Sixty-six patients with exstrophy of the bladder observed in the Mayo Clinic from 1901 to April 1, 1926 inclusive, were operated on. Forty-eight of these are living and eighteen are dead. Sixteen patients between the ages of 2 and 6 years are living, six between the ages of 6 and 10 years, seven between 10 and 20 years, thirteen between 20 and 30 years, and six between 30 and 40 years, and more one patient being 40 years and another 73 years. Eight patients died between the ages of 2 and 6 years, one between 6 and 10 years, one between 10 and 20 years, seven between 20 and 30 years, and one between 30 and 40 years.

Thirty-three of the patients living are males and fifteen are females. Eight of the patients who died were males, and ten were females. Forty-four of the living were single

and four were married. Seventeen of those who died were single and one was married.

Forty-four of the patients who are living and seventeen of those who died had congenital exstrophy of the bladder. Exstrophy followed childbirth in two cases, one patient is living and one died 6 months after a plastic operation on the bladder. Exstrophy followed suprapubic cystostomy in one case in which a plastic closure was made and the patient is living at the age of 75 years. Total epispadias without sphincter control occurred in seven cases, and total hypospadias without sphincter control occurred in one case.

Fourteen patients were operated on from 1901 to 1915 inclusive, and from January 1, 1916 to April 1, 1926 fifty-two patients were operated on, various types of operations being performed. Plastic operation alone for closure of the bladder was performed in eight cases, transplantation of both ureters in forty-six cases, transplantation of one ureter in nine cases, exploration with closure because of hydro-ureter or hydronephrosis in two cases, transplantation of one ureter to the hepatic flexure in one case, suprapubic cystostomy for excision of carcinoma of the bladder in one case, the Moynihan operation in two cases, and the recent Coffey operation in three cases. In two of these both ureters were transplanted simultaneously, and in the other one ureter was transplanted.

The mucosa of the bladder was malignant in five cases. Four of these patients are living, their ages vary from 6 to 48 years. Seven patients had been operated on previously in an attempt to remedy the exstrophy or epispadias. In six cases one attempt had been made to perform a plastic operation on the bladder, and in one case five attempts had been made. In one case of epispadias nine attempts had been made to restore the urethra.

Besides the operation for the exstrophy, various other operations were performed at the same time or following it. In one case hemiotomy was done at the time of the operation for exstrophy. Nephrostomy for a gangrenous ureter was performed in one case, and in one pyelostomy for postoperative acute

obstruction of the ureter. In this group there were two patients with but one kidney. The ureters were transplanted. Both patients are alive. Two patients had hydro ureter and hydronephrosis. The ureters were not transplanted.

Twenty nine patients have reported relative to their condition. Twenty-five are satisfied with the results. Two have poor control of urine by rectum. The reports on the control of urine by rectum by day, varied from 2 to 5 hours, and by night from 3 to 8 hours. Some patients did not have to pass urine at night. Others could hold their urine from 2 to 3 hours and from 8 to 10 hours. Only one patient reported incontinence. Bowel movements varied from five to six times a day to once or twice a day. The general health of the patients was invariably good, most of them had gained in weight, had good appetites and slept well.

Six of the twenty nine patients are living from 1 to 3 years after operation, ten are living from 3 to 6 years, in other words sixteen are living from 1 to 6 years, ten are living from 6 to 12 years, and three are living from 12 to 15 years. Seven of the nineteen patients not heard from were operated on since August, 1923.

Patients who died are classified in two groups: those dying in the hospital and those dying after leaving the clinic. Eleven patients (16.6 per cent) died in the hospital. Their ages varied from 3 to 40 years. Seven were males and four were females. They lived from 2 to 19 days after operation. At necropsy peritonitis was given as the cause of death in five cases. Pyelitis, pyelonephritis, pyonephrosis, hydro ureter and hydronephrosis with uræmia were the causes in six cases. Seven patients whose ages varied from 2 to 25 years died after leaving the clinic. They lived from 2 months to 12 years after operation. One patient died from pneumonia, one from typhoid fever, one from metastasis from carcinoma of the bladder, one from nephritis and one from tuberculosis of the lungs. One patient died 12 years after operation following an accident which occurred during an attack of epilepsy. The cause of one patient's death was not determined.

In one case listed as a hospital death the patient aged 40 years had had a plastic operation on the bladder 35 years before. At the Mayo Clinic a piece of tissue was removed for diagnosis from suspicious appearing mucosa of the bladder. The patient died 4 days later of pre existing pyonephrosis and perinephritic abscess.

From January 1, 1910 to April 1, 1926, twenty nine patients with advanced exstrophy and epispadias were observed but not operated on because they were too young because the sphincter and muscles were relaxed and they were unable to control bowel movements because there was a malignant growth of the bladder or because they were operated on for conditions other than exstrophy.

The ages of these twenty nine patients varied from 2 months to 50 years, and six were from 2 to 6 months old, one patient was 8 months. Five were from 1 to 3 years, six varied from 3 to 12 years, one was 14 years, eight varied from 20 to 35 years and two from 35 to 55 years. Twenty four patients were males and five were females. Twenty eight were single and one was married. Twenty five had complete exstrophy and four had partial exstrophy. Twenty two with epispadias had control of the sphincters. Two of the patients with exstrophy had been operated on twice elsewhere, two had had from two to four operations and one had had twelve. Two patients with epispadias had been subjected to operation on one or two previous occasions.

Nephrectomy was performed on two patients with exstrophy of the bladder, and nephrothotomy on one with subsequent perinephritic abscess.

Twelve of the patients with exstrophy were examined from 1910 to 1916, inclusive, and seventeen were examined from 1917 to April 1, 1926. One patient came first in 1912 and returned 14 years later, in 1926, with epithelioma involving the nodes of the groin and the liver.

Eleven patients were too young to be operated on and were told to return later. Six patients had relaxed sphincter and muscles and involuntary bowel movements, and it was thought inadvisable to operate.

BIBLIOGRAPHY

- 1 COFFEY R C Physiologic implantation of the severed ureter or common bile duct into the intestine J Am M Ass 1911 lvi 397-403
- 2 Idem A technic for simultaneous implantation of the right and left ureters into the pelvic colon Northwest Med 1925 xxiv 211-215
- 3 MAYDL K Ueber die Radikaltherapie der Blasenektomie Wien med Wchnschr 1896 xlv 28-31
- 4 MAYO C II Exstrophy of the bladder Contributions to Medical and Biological Research New York Paul B Hoeber 1920 pp 1095-1110
- 5 MOYNIHAN G B A SIR The extroversion of the bladder relief by means of the transplantation of the bladder into the rectum Ann Surg 1906 xlv 237-240
- 6 NEUDORFER Quoted by Mayo
- 7 SIMON Quoted by Mayo
- 8 SPOONER Quoted by Mayo

TREATMENT OF RECURRENT LARYNGEAL NERVE PARALYSIS BY NERVE ANASTOMOSIS¹

By CHARLES H FRAZIER M D F A C S AND W BLAIR MOSSEI M D, PHILADELPHIA
From the Neurological and Thoracic Departments of the University Hospital Philadelphia, Pa.

THE possibility of injury to the recurrent laryngeal nerve during operations on the thyroid gland has always been recognized and today every surgeon uses well defined methods to prevent the occurrence of this most distressing condition. That the accident may occur however in the hands of the most experienced operators is frequently demonstrated that it should occur much more frequently in operations performed by the occasional goiter surgeon is not only true but is altogether natural.

Paralysis of the recurrent laryngeal nerve implies paralysis of the intrinsic muscles of the larynx the dilators constrictors and tensors. The cord hangs in a flaccid state and narrows the lumen of the larynx by approaching and finally reaching the midline. It is in this stage that dyspnea becomes acute. Gradually the cord loses its tonus and the glottic chink is again widened. This cadaveric position of the cords is known as "total" or "complete" paralysis. It is in this stage that the voice becomes husky or aphonic. Frequently before this cadaveric stage occurs, and occasionally afterward there may be no disturbance of phonation especially when the paralysis is due to pressure, as from an annular thyroid.

Appreciating this fact we have for several years in the Thyroid Clinic of the University Hospital included in our routine examination,

an examination of the larynx previous to operation.

Until comparatively recently treatment of recurrent laryngeal paralysis was either symptomatic or at best palliative. Tracheotomy either as an heroic effort to prevent suffocation to relieve or prevent embarrassing dyspnea is a well justified procedure. Dilatation of the glottis with bougies while admittedly of benefit is transient and requires frequent repetition. Ventriculocordectomy which implies the removal of all of one vocal cord and the adjacent ventricular floor inferior to the vocal process has been in the hands of an efficient laryngologist the operation of choice. This ingenious operation relieves the inspiratory dyspnea by permitting an adequate exchange of air but it does not prevent air waste — nor does it preserve or restore the power of phonation the patient for many months being unable to talk above a whisper although eventually a fairly loud rough phonation may in favorable cases be obtained. It is therefore destructive in character, and limited in its usefulness.

About 3 years ago Dr. Chevalier Jackson, who has seen and treated a great many patients with postoperative laryngeal paralysis first suggested that some form of constructive operation might be successful. To Dr. Jackson and his associate, Dr. Gabriel Tucker we are deeply indebted for whatever success the

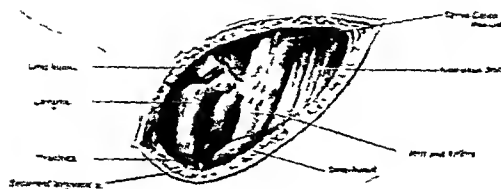


FIG. 1. Larynx.

operation may have had. Without their cooperation in the recurrent examination of the patients we would be entirely unable to evaluate the results.

Anastomosis of the proximal portion of one nerve to the peripheral portion of another is of course an accepted procedure in application to the problem of traumatic recurrent laryngeal palsy as one of inference. To Dr. J. J. J. belongs the credit of first suggesting the feasibility of such an anastomosis. To Dr. Frazer the credit for perfecting the technical technique.

From anatomical and physiological considerations the descending hypoglossal nerve (often called the descending run) was selected. Situated comparatively close to the recurrent laryngeal nerve easily accessible as it crosses downward on the sheath of the carotid vessels and of sufficient length to allow transportation without tension the descending branch is anatomically ideal. Physiologically it is entirely motor in function

and supports indirectly the action of which is concerned in those of the larynx thus fulfilling all the requisites of our present knowledge of nerve implantation.

The technical procedure need not be related in detail. It is of interest only to a very few. Sufficient to say that the first step consists in isolating and identifying the stump of the recurrent laryngeal nerve which may be a long and tedious procedure because of the presence of cicatrices the disturbance of normal relations secondary to previous complete avulsion of the nerve. The dissection should begin at the point where the nerve enters the larynx, i.e., at the inferior cornu of the thyroid cartilage. When found, the nerve is then traced downward until its point of severance or constriction is found. Occasionally the innervating force may be one only to scar tissue in which the nerve after liberation is found to be intact. In all of our cases however actual severance of the nerve had occurred. At this point it is entirely possible

BIBLIOGRAPHY

- 1 COFFEY R C Physiologic implantation of the severed ureter or common bile duct into the intestine *J Am N Ass* 1911 lxv 397-403
- 2 Idem A technic for simultaneous implantation of the right and left ureters into the pelvic colon *Northwest Med* 1925 xxv 211-215
- 3 MAYDL K Ueber die Radikaltherapie der Blasenektomie *Wien med Wchn chr* 1896 xlv 28-31

- 4 MAYO C H to Medical Paul B Hoe
- 5 MOYNIHAN G bladder retractor the bladder *J Am* 237-240
- 6 NEUDORFER Q
- 7 SIMON Quoted L
- 8 SPOONER Quoted

TREATMENT OF RECURRENT LARYNGEAL NERVE BY NERVE ANASTOMOSIS¹

By CHARLES H. FRAZIER, M.D., F.A.C.S., AND W. BLAIR MOSSBERG,
F.R.M.H.N.S., F.R.C.S. (Lond.), F.R.C.S. (Ed.), F.R.C.S. (Glasg.), F.R.C.S. (Ireland), F.R.C.S. (Australia), F.R.C.S. (Canada), F.R.C.S. (France), F.R.C.S. (Germany), F.R.C.S. (Italy), F.R.C.S. (Japan), F.R.C.S. (Spain), F.R.C.S. (Sweden), F.R.C.S. (Switzerland), F.R.C.S. (U.S.A.), F.R.C.S. (U.S.S.R.), F.R.C.S. (Yugoslavia)

THE possibility of injury to the recurrent laryngeal nerve during operations on the thyroid gland has always been recognized and today every surgeon uses well defined methods to prevent the occurrence of this most distressing condition. That the accident may occur however in the hands of the most experienced operators is frequently demonstrated that it should occur much more frequently in operations performed by the occasional goiter surgeon is not only true but is altogether natural.

Paralysis of the recurrent laryngeal nerve implies paralysis of the intrinsic muscles of the larynx, the dilators, constrictors and tensors. The cord hangs in a flaccid state and narrows the lumen of the larynx by approaching and finally reaching the midline. It is in this stage that dyspnoea becomes acute. Gradually the cord loses its tonus and the glottic chink is again widened. This cadaveric position of the cords is known as "total" or "complete" paralysis. It is in this stage that the voice becomes husky or aphonic. Frequently before this cadaveric stage occurs, and occasionally afterward, there may be no disturbance of phonation, especially when the paralysis is due to pressure as from an annular thyroid.

Appreciating this fact we have for several years in the Thyroid Clinic of the University Hospital included in our routine examination,

an examination of the operation.

Until comparatively recent years recurrent laryngeal paralysis was symptomatic or at best a nuisance, either as an heroic suffocation to relieve or prevent dyspnoea is a well justified intubation of the glottis with limited benefit is trans frequent repetition. Ventilation which implies the removal of cord and the adjacent ventricle prior to the vocal process has been of an efficient laryngologist the choice. This ingenious operation of inspiratory dyspnoea by permutate exchange of air but it does not waste — nor does it preserve the power of phonation the many months being unable to talk, however although eventually a fairly good phonation may in favorable cases be obtained. It is therefore, destructive in character limited in its usefulness.

About 3 years ago Dr. Chevalier, who has seen and treated a great many patients with postoperative laryngeal paralysis, first suggested that some form of constriction operation might be successful. To Dr. Simon and his associate, Dr. Gabriel Tucker, are deeply indebted for whatever success

directly to the gall bladder by way of the lymph stream (see injection point 5 on Figure 1)

When, however, the point of injection was either in the middle or the third portion of the duodenum, the dye was found to enter the mesenteric lymph gland which is situated at the beginning of the portal vein after passing through the lymphatic vessels under the peritoneum between the duodenum and the portal vein. These lymphatic vessels pass over the pancreas and do not enter its substance though Bartels stated that they do enter it (see injection points 3, 2, and 1 on Figure 1)

If the solution is injected into the lymphatic vessels immediately beneath the serosa of the gall bladder or at the entrance of the portal vein into the liver, the dye is carried to the upper part of the duodenum and to the lymph glands alongside the portal vein. The dye is also seen in the lymphatic vessels on the surface of the right tail of the pancreas and in the lymph gland at the beginning of the portal vein (see injection point 4 on Figure 1). This finding that the lymph drainage from the gall bladder passes over the surface of the pancreas and does not enter its substance, agrees with Archibald's contention and is in disagreement with the findings of Denver and Sweet (4) and of Graham and Peterman. This relationship occurs in the normal dog. If, however, the gall bladder is adherent to the surface of the pancreas, then a direct anastomosis between the lymphatics of the gall bladder and those of the parenchyma of the pancreas exists. This latter finding may explain the disagreements above noted.

INJECTION OF THE PANCREAS

When the injection is made in the parenchyma of the pancreas, the dye reaches the mesenteric lymph gland located at the beginning of the portal vein, 10 or 20 hours after injection.

INJECTION OF ASCENDING COLON NEAR THE APPENDIX

When the injection is made into the lymphatics of the wall of the beginning of the ascending colon near the appendix the dye

reaches the mesenteric lymph gland located at the beginning of the portal vein.

INJECTION OF SMALL INTESTINE

After the injection of the subserous lymphatics of the ileum or jejunum, the dye is seen in various mesenteric lymph glands but not in the one near the portal vein.

INJECTION OF RECTUM

After injection of the subserosa of the rectum, the dye is seen in the lymph gland in front of the sacral promontory but not in the gland near the portal vein.

From the observations above certain conclusions can be drawn. The lymph which comes from the liver, gall bladder, duodenum, pancreas and first portion of the ascending colon always drains into the lymph gland which is located at the beginning of the portal vein. On the other hand the lymph from the rest of the intestine is discharged into the various other mesenteric lymph glands. In the dog there are two large lymph sacs, one of which is called the retroperitoneal lymph sac which occurs in the human only in the embryo. The other sac is the receptaculum chyli. A communication between these two sacs exists in a duct. Thus the two sacs really form one long sac. The retroperitoneal lymph sac is located at the posterior internal surface of the vena cava inferior behind the peritoneum. Some of the efferent vessels from the gland at the beginning of the portal vein drain into the retroperitoneal lymph sac and some of them into the receptaculum chyli. The posterior intercostal lymph vessels of the right side drain into the retroperitoneal lymph sac by anastomosing vessels along the inferior vena cava upward. The lumbar and pelvic lymphatics of the right side also eventually drain into the retroperitoneal lymph sac.

The work of Davis (3), who made a statistical study of the thoracic duct in man, showed that the main lymph vessels of the mesenteric glands enter the cisterna chyli directly, although all the glands possess more or less of an anastomosis between each other. My experiments on the dog give practically the same results, i.e., almost all the mesenteric lymph glands have a direct connection with the

cisterna chyli. The dog however differs in that the mesenteric lymph gland which is placed at the beginning of the portal vein always drains into the retroperitoneal lymph sac.

The lymphatics of the gall bladder were first accurately described by Sudler (23) working in Mall's laboratory. He also demonstrated the communication between those of the gall bladder and the intrabepatic lymph vessels. His work has been important in lending evidence to the lymphatic origin of cholecystitis as developed by Graham Peterman and Priest (7 and 20). Harer Hargis and Van Meter (9) tested the activity of the lymphatic vessels in animals by introducing into the lumen of the gall bladder a hypertonic solution of potassium sulphocyanide after which the lymph in the subserous lymphatic vessels was collected in fine capillary tubes inserted into those lymphatic vessels. When the lymph so obtained was tested with ferric chloride a Prussian blue reaction occurred. It was already known from the work of Rous and McMaster (22) that the rich lymphatic supply of the gall bladder is probably the means of absorption of fluid during the process of concentration of the bile in the gall bladder. In my own experiments I found that when the trypan blue solution is injected into the subserous lymphatics of the gall bladder, it appears at the upper end of the duodenum after traversing the lymph vessels along the gall bladder and in the hepatoduodenal and cystoduodenal ligament¹ and it is found also in lymph glands along the portal vein. Along the portal vein there are usually three lymph glands of which two are placed on the anterior surface of the vein and one of them posterior to it. The lymph from the right lobe of the liver enters chiefly the gland posterior to the portal vein but that from the other lobes and from the gall bladder enters the glands anterior to the vein. Almost all of the lymph from these glands passes into the retroperitoneal lymph sac. Not only was it found in my experiments that the lymph stream passes from the gall bladder to the upper part of the duodenum and the glands anterior to the portal vein

but also I found that the lymph channels of the surface and parenchyma of the liver were stained by the dye. The lymphatic vessels on the surface of the liver especially of the middle lobe, were greatly enlarged and seemed to be completely filled by the colored solution as were also the perivascular lymphatics slightly beneath the surface of the liver. That these results are not due to the possibility of the transportation of the dye by the blood stream but must be due to lymphatic transportation is shown by the fact that after ligation of the abdominal aorta above the origin of the coeliac axis the same results can be obtained within 3 or 4 hours after the injection.

EXPERIMENTS TO DETERMINE THE EXCRETION OF SUBSTANCES THROUGH THE WALL OF THE GALL BLADDER

In another series of experiments I attempted to find out whether substances enter the lumen of the gall bladder in any other way than through the cystic duct. The problem in other words was to determine whether the gall bladder has an appreciable power of excreting substances. For this purpose various dyes were injected intravenously after ligation of the cystic duct and the contents of the gall bladder were examined for them. The substances used were trypan blue, sodium phenoltetrachlorophthalein and sodium tetrabromophenolphthalein. The dyes were injected after ligation of the cystic duct near the common duct and after a catheter had been placed in the fundus of the gall bladder in order to collect the contents of the gall bladder. Also before the injection the gall bladder was washed out with physiological saline solution. In some cases it was left empty and in other cases salt solution or some bile was allowed to remain in it. The doses of the different substances used varied from 0.01 to 0.5 gram per kilo. The experiments were, however, practically negative. Traces of trypan blue were found in the contents of the gall bladder 2 hours after the injection when normal gall bladder bile was allowed to remain in it.

In another series of experiments a gelatin solution was put into the lumen of the gall bladder instead of bile and 24 hours after the injection the gall bladder was removed. It

¹ A series of sixteen dogs the cystoduodenal ligament was found to be present only 23 per cent. The ligament passes from the upper part of the gall bladder to the wall of the upper part of the duodenum above the common duct.



Fig. 1. Distribution of lymphatics about the gall bladder, duodenum and portal vein in the dog. The duodenum and pancreas have been rotated to the left so that the posterior surface of each is exposed to view. Trypan blue injected into subserosal lymphatics of gall bladder at site 4 passes through lymphatic vessels to the first portion of the duodenum (the ulcer portion) at site 3, and to the glands about the portal vein. Conversely also when an injection is made at site 3 most of the fluid passes through lymphatic vessels to the gall bladder. The importance of this from the standpoint of the association of cholecystitis and duodenal ulcer is obvious. When subserosal injections are made in the duodenum at sites 3 and 4 the fluid passes over the pancreas to the lymph nodes about the portal vein. After a 5 to 10 ml injection of the appendix, which is situated high in the dog, and the pancreas the dye may be traced in the lymphatics to the nodes about the portal vein.

The Lymphatics of the Extrahepatic Biliary Passages—Shurichi Kodama

together with its contents, was placed in an ice box to make the gelatin firm. After removal, the surface of the gelatin was found to be green, thus indicating some excretion of trypan blue into the gelatin. In control cases in which no injection was made, the gelatin was brownish yellow. In another experiment the liver was first washed out with Locke's solution through the hepatic artery. Then gradually a trypan blue and gelatin solution in physiological saline (1 gram trypan blue, 5 grams gelatin, physiological solution up to 100 cubic centimeters) was injected into the hepatic artery after ligation of the cystic duct and vessels. The wall of the gall bladder was stained with the dye and the contents were colored greenish blue but the amount of dye excreted was too small to be measured quantitatively. Trypan blue was used in fourteen experiments, but in only three was there found an excretion of the dye into the gall bladder. These experiments therefore indicate that, at least as regards trypan blue, there is very little secretion through the wall of the gall bladder.

With the idea that perhaps more secretion would take place if the animal were given an opportunity to recover from the operative trauma before making the injection, the following experiment was performed on a dog. A gall bladder fistula was created after ligation of the cystic duct, cystic artery and vein, and the dog was then kept for a week after the operation. Trypan blue was then injected intravenously every day in doses of 0.5 gram per day for 3 days. No bile was ever found escaping from the fistula, but the contents were colored blue from the presence of the dye. On the other hand, the contents of the common duct were reddish violet because of the mixture of bile and dye. This finding seems to confirm the idea that there is some excretion of the dye directly through the wall of the gall bladder.

When phenoltetrachlorophthalein was used in a similar way, by means of a gall bladder fistula after ligation of the cystic duct and vessels, the contents of the gall bladder 2 or 4 hours after injection were brownish red and somewhat resembled coagulated blood. When this material was diluted and shaken with

water the color of the solution became scarlet. But when in alkaline solution was added the scarlet color disappeared. For that reason it is impossible to be sure whether the red color was due to excreted dye or to hæmoglobin.

In order to be more certain of the presence of the dyes in the gall bladder under the conditions mentioned above, it was decided to examine the contents with the spectroscopic. It was thought that if the special absorption band of the different dyes in the bile could be found, it would prove to be a useful method. But, although pure solutions of the halogenated phenolphthaleins used have sharp absorption bands, it was impossible to find them in the small concentrations in which these substances must be present if excreted through the wall of the gall bladder. Even in the greater concentration in which they are present in the gall bladder when the cystic duct has not been previously ligated, they cannot be found spectroscopically because of the interference of the bile. Thus no special absorption bands could be recognized in solutions of 1 centimeter thickness of 0.001 molecular weight solution of the sodium salt of phenoltetrachlorophthalein. However, in more concentrated solutions special absorption bands were found as follows: 5790\AA° for tetrabromphenolphthalein, 5890\AA° for tetraiodophenolphthalein, 5790\AA° for phenoltetrachlorophthalein. The sodium salts of both tetrabromphenolphthalein and of tetraiodophenolphthalein fluoresce, the former more strongly than the latter.

Abel and Rowntree (1), who first made biological use of phenoltetrachlorophthalein, after it had been prepared originally by Orndorff and Black (19) in 1909, showed that it is excreted from the blood almost entirely by the liver. This dye, however, is excreted to some extent both in the urine and through the intestinal wall even when the direct pathway from the liver to the intestine has been cut off by the establishment of a common duct fistula.

To determine this fact, a glass tube was connected with the common duct, and while the dog was still under anæsthesia an intravenous (jugular vein) injection of the dye was made, after which the contents of the intestine were

collected 2 or 3 hours later. When a solution of sodium hydroxide was added to the collected coagulants, the color changed from a yellowish gray to pink or violet, the characteristic color reaction of phenoltetrachlorophthalein. In other experiments the small intestine was tied off in several places before making the injections, producing in this way a number of intestinal pouches isolated from each other. In this way it was found that the dye was excreted through the wall of the stomach, the duodenum and the jejunum. Likewise also it was found to be excreted through the wall of the appendix 4 to 8 hours after the injection.

In experiments in which a common duct fistula was made but in which the intestine was not tied off the stain spread down the whole length of the intestine within 20 hours but disappeared after 48 hours. The excretion through the wall is faster if the injection is not made until about 10 days after establishing the common duct fistula. In other words, after the traumatic effects of the operation have disappeared. If the creation of the fistula is combined with a cholecystectomy both the rate and the amount of excretion through the intestinal wall seem to be greater.

In order to investigate the possible rôle of the lymphatics in the phenomenon of excretion of the dye through the intestinal wall other experiments were performed. A cannula was inserted into the abdominal aorta just below the coeliac axis. The aorta was then ligated below this and the inferior vena cava was doubly ligated and sectioned between the ligatures. The blood vessels of the lower half of the body were then washed out by running physiological salt solution through the cannula. The gastroduodenal and pyloric arteries were ligated after which a solution of the dye was injected through the hepatic artery. The dye was recognized in the lymphatics of the gall bladder and liver and entered the lymph gland beside the portal vein. From there it ascended toward the duodenum within 2 hours, but it did not actually reach it.

That a solution of trypan blue can pass through the lymphatics in either direction (ascendingly or descendingly) seems probable. For example when the solution was injected into the efferent lymphatics at the hilus of the

portal vein gland, the dye passed in the reverse direction through the lymph sinuses to the peripheral sinus and from there into the afferent lymph vessels. Although there is a direct connection between the lymph sinuses and the peripheral sinus, the flow under normal conditions is from the latter to the former. It was noted also that when, in some dogs, obstructions to the efferent lymphatics from the portal vein gland seemed present, there occurred first an enlargement of the cortex and later of the medulla of the gland, especially after atrophy of the cortex. When an enlargement of the medulla occurred, dilatation of the lymph sinuses and of the peripheral sinus was noted. Incidentally also large numbers of red blood corpuscles were found contained in the lymph sinuses 24 hours after injection of the dye and the gland resembled in appearance a hæmolymp gland. The evidence of the possibility of a reversal of flow in the lymphatics lends some support to the theory of a lymphatic vicious circle between an inflamed gall bladder and the liver which was advanced by Graham and Peterman in this laboratory.

EXCRETION OF TRYPAN BLUE THROUGH THE GALL BLADDER WALL

In another series of experiments intravenous injections of a 1 per cent solution of trypan blue were injected into the jugular veins of dogs. Twenty-four hours later, the gall bladders were removed for histological examination. In one set of dogs nothing more was done than the intravenous injection. But in another set ligation of the cystic duct, artery, vein and lymphatic vessels along the duct was performed. The only blood and lymph supply to the gall bladder were the vessels in the attachment of the gall bladder to the liver.

In the former experiments which served as controls, the following observations were made. In the mucous membrane of the gall bladder, the epithelial cells seemed normal and were not stained by the dye. In the supporting tissue of the villi however the dye was recognized here and there. In the muscular coat the thin layer of connective tissue was always stained slightly by the dye. No dye was found in the fibrous layer.

In the latter experiments, in which ligation of the cystic duct and vessels had been performed, the dye was found in the mucous membrane between the epithelial cells in the mucus lying free in the lumen and in the stroma of the papilla, but not in the epithelial cells themselves. In the muscular coat there was more staining than in the control animals, especially in the thin layer of dense connective tissue and in the lymphatic vessels which were enlarged sometimes ten or fifteen times greater than normal. In the fibrous coat, almost all of the lymphatic vessels were enlarged and filled by the contained colored lymph. Even the cytoplasm and nuclei of the connective tissue fibers surrounding the blood vessels were stained also.

In the former experiments, therefore, although the bile in the gall bladder contained much dye the epithelial cells of the mucosa were not stained at all, and in the whole wall of the gall bladder there was very little dye. It was concluded, therefore, that if any dye was absorbed through the mucous membrane of the gall bladder it could not be in large quantity. Moreover, there could not have been much excretion through the gall bladder into the lumen. In the latter experiments, on the contrary, a considerable amount of dye was found all through the wall. This result seemed to indicate very clearly that under the conditions of the experiment, the wall of the gall bladder has a definite excretory function. Perhaps this was due to injury to the gall bladder produced by the ligation of its principal vessels, especially since the gall bladder generally appeared oedematous.

OBSERVATIONS ON THE LYMPHATICS OF THE LIVER

The origin of the lymphatics of the liver was first definitely determined by MacGillivray (16) who studied this subject under the direction of Ludwig. Long before the work of MacGillivray, it had been observed that ligation of the common bile duct was followed by passage of bile over into the lymphatics. From this observation it was but natural to observe the artificial filling of the lymphatics after injecting a colored fluid into the bile duct. Sections of liver in which the lymphatics

had been filled with Prussian blue or with asphalt showed that the fluid injected into the bile ducts leaves them at the periphery of the lobule to enter spaces surrounding the blood capillaries, the so called perivascular lymph spaces. These spaces communicate at the periphery of the lobule, in the center of the portal unit, directly with the interlobular lymph channels. Frequently there is an extravasation of the injection mass into the blood capillaries of the lobule. By a direct injection of Prussian blue into the wall of the portal or hepatic vein it is found that the injected dye enters the center of the portal unit and from there radiates and encircles the blood capillaries. According to Fleischl (6) all the bile is taken up by the lymphatics after ligation of the bile duct, and in case the thoracic duct is also ligated, no bile or only a trace of bile ever reaches the blood. This observation of Fleischl has been confirmed by Kunkel (14), Kufferath (13), and Harley (10). They showed that the perivascular spaces first take up the bile after ligation of the bile duct and they found also that fluids injected into the bile duct pass with ease over into the lymphatics but only with difficulty into the bile capillaries.

Mall (17) found one of the most convenient methods of demonstrating the lymphatics to be the injection of a gelatin solution into the portal vein. In many instances beautiful injections of the lymphatics were obtained from the vein. Also, when the solution was injected into the bile duct the lymphatics were demonstrated more easily than the finer bile ducts. Rolleston (21) stated that there are two main sets of lymphatics of the liver (a) those which run along the portal spaces and (b) those which supply the capsule or are superficial. Evans (5) has shown that the typical lymphatic vessel of the liver is accompanied along one or two axes by long arteries and veins which give off a capillary plexus. This capillary plexus is truly adventitial in character, but rests directly on the muscle of the media, in this respect resembling that of the arterial walls.

My own experiments have shown that the capillary walls are very pervious and that the blood plasma passes easily from them out into

the perivascular spaces to bathe the liver cells. It is well known that many of the lymph radi-
cles of the capsules of Glisson, of the larger
lymph channels of the perivascular spaces
around the capillaries, and Kupffer's syncytial
cells may be filled with the dye. My results,
therefore, agree entirely with those described
by previous authors. I showed, furthermore,
that the lymphatic vessels on the surface of the
liver are filled by the dye.

To Prof. Dr. E. A. Graham I owe my most sincere
gratitude first for his having suggested the idea of my
investigating this subject and then for his expert direc-
tions during my work.

CONCLUSIONS

1. The lymphatics of the duodenum and
gall bladder are intimately and directly con-
nected.
2. Some of the lymphatic vessels of the
liver, gall bladder, duodenum, pancreas, and
appendix enter the lymph glands which are
located about the portal vein.
3. The lymphatic connection of the liver
and gall bladder is made in the parenchyma
and capsule of the liver.
4. Phenoltetrachlorophthalein is not normal-
ly secreted by the wall of the gall bladder, but
it is secreted through the wall of the duodenum
and of the jejunum.

BIBLIOGRAPHY

1. ABEL J. J. and ROWNTREE L. G. On the pharma-
cological action of some phthaleins and their be-
havior as purgatives. *J. Pharm. & Exper. Therap.*
1910 1: 231.
2. BRANTLAWAITE J. V. C. Evidence of pancreatic dis-
order in rickets. *Brit. M. J. London* 1912 1: 739.
3. DAVIS H. K. A statistical study of the thoracic duct
in man. *Am. J. Anat.* 1914 xvii: 213.
4. DEEVER J. B. and SWEET J. E. Prepancreatic and
postpancreatic disease with a consideration of the
anatomic basis of infections from the gall bladder to
the pancreas. *J. Am. M. Ass.* 1921 lxxvii: 194.
5. IVANS H. M. The blood supply of lymphatic vessels
in man. *Am. J. Anat.* 1907 vii: 105.
6. LEISCHL E. Von der Lymphe und den Lymphge-
fäßen der Leber. *Arch. a. d. physiol. Anstalt Leip-
zig* 1874 ix: 24.
7. GRAHAM L. A. Hepatitis: a constant accompaniment
of cholecystitis. *Surg. Gynec. & Obst.* 1918 xxvi: 521.
8. GRAHAM E. A. and PETERMAN M. G. Further ob-
servations on the lymphatic origin of cholecystitis,
choledochitis and the associated pancreatitis. *Arch.*
Surg. 1922 iv: 23.
9. HAKER W. B., HARGIS E. H. and VAN METER V. C.
Studies of the function of the gall bladder. *Surg.*
Gynec. & Obst. 1922 xxiv: 307.
10. HARLEY V. Leber und Galle während dauernden
Verschlusses von Gallen und Brustgang. *Arch. f.*
Physiol. 1893 xv: 291.
11. HEYD C. G., MACNEAL W. J. and KILLIAN J. A.
Hepatitis in its relation to inflammatory disease of
the abdomen: a clinical and laboratory study. *Am.*
J. Obst. & Gynec. 1924 vii: 413.
12. JUDD E. S. Relation of the liver and pancreas to in-
fection of the gall bladder. *J. Am. M. Ass.* 1921
lxvii: 197.
13. KUPFERATH. Ueber die Abwesenheit der Gallensauren
im Blute nach dem Verschluss des Gallen- und des
Mischbrustganges. *Arch. f. Physiol.* 1880 vii: 92.
14. KUNKE A. Ueber das Verhältniss der mit dem Li-
eweiss verzeihren zu der durch Galle au geschiedenen
Schwefelmenge. *Arch. a. d. physiol. Anstalt Leip-
zig* 1875 x: 112.
15. MCCARTY W. C. and JACKSON A. The relation of
hepatitis to cholecystitis. *Minnesota Med.* 1921 iv:
377.
16. MACGILLAVRY T. H. Zur Anatomie der Leber.
Sitzungsber. d. Akad. d. Wissensch. Math. naturw.
Cl. Wien 1864.
17. MALL F. P. On the origin of the lymphatics in the
liver. *Johns Hopkins Hosp. Bull.* 1901 xii: 146.
18. ORTEL H. Lymphangitis and perilymphangitis of
the liver in their relations to the inflammations of
the organ. *Arch. Int. Med.* 1908 1: 384.
19. ORNDORFF W. R. and BLACK J. A. Phenoltetra-
chlorophthalein and some of its derivatives. *Am.*
Chem. J. 1909 lvi: 349.
20. PETERMAN M. G., PRIEST W. S. and GRAHAM E. A.
The association of hepatitis with experimental
cholecystitis and its bearing on cystitis in the hu-
man. *Arch. Surg.* 1921 ii: 92.
21. ROLLESTON H. D. Points in diagnosis, prognosis and
medical treatment of gall bladder disease. *Internat.*
Clin. 1922 iv: 108.
22. ROUS P. and McMASTER P. D. *Proceedings Soc.*
Exp. Biol. and Med. Yale Univ. 1920 xii: 215.
23. SUDLER M. T. Architecture of the gall bladder.
Johns Hopkins Hosp. Bull. 1901 xii: 126.

FEMORAL HERNIA, PRINCIPLE AND PROCEDURE

BY R. HAMILTON RUSSELL, F.A.C.S. (Hon.) F.R.C.S. (Eng.), MELBOURNE, AUSTRALIA

IN the November, 1925, issue of SURGERY, GYNECOLOGY AND OBSTETRICS appears a contribution from me entitled "Inguinal Hernia and Operative Procedure." In this I expressed regret at my inability to make more than a passing allusion to femoral hernia, and the present paper is designed to supply that deficiency. I shall also seize the opportunity of commenting on the latest contribution made to this subject by my distinguished friend (and, in this matter my vigorous opponent and critic) Sir Arthur Keith in the Mitchell Bruce lecture on the "Origin and Nature of Hernia¹."

The question is this: Is the femoral sac of developmental origin, and a necessary antecedent of femoral hernia? Or is the sac formed by intra abdominal pressure outward? In other words, does the sac form first and invite the hernia, or does the hernia make the sac by pushing the peritoneum in front of it?

It is impossible to overestimate the practical importance of finding the correct answer to this question. On the one hand if we recognize that the sac is the necessary antecedent of the hernia, it will render possible the adoption of a standard and uniform method of treatment of extreme simplicity, closely analogous to the simple removal of the sac in oblique inguinal hernia. On the other hand, so long as we continue to hold the view that the sac is formed with the hernia, there will be no limit to the operative devices, many of them dangerous, most of them injurious, and all of them uncertain, such as we have seen in abundance in past years and still see.

The clinical features that proclaim the sacular origin of femoral hernia appear definite and unmistakable. I do not propose to repeat here the history of the sacular theory as applied to femoral hernia². I wish merely to state the present position of the subject as it presents itself to me.

The femoral sac is an abnormal constituent of the lower limb, formed by a developmental defect or accident. The lower limb takes its origin at an early period of embryonic life as a limb bud, and from the first moment of its inception to the last moment of adult maturity, it is the seat of progressive developmental change upon which the growth of the limb is dependent. At each moment of existence during a score of years, every constituent of the limb is progressively receding further from the trunk, and for our present purpose we will fix our scrutiny upon the main vessels.

These also must in every part of them be making a slow progress downward, so that a point on the femoral vessels which at birth was immediately opposite to Poupart's ligament will, by the time adult size has been reached, be considerably lower down. We can see certain obvious results of this process in the course of the branches of the femoral artery (Fig. 1). These map out for us the exact nature of the early embryological evolutions far more accurately than the eye of embryological research could ever enable us to see them. This slow descent of the femoral vessels, however, involves another delicate evolution. In the trunk the vessels are in close relation with the peritoneum, but the peritoneum must not accompany the vessels into the limb, it must pull up short at the crural ring, leaving the vessels to travel downward alone, and failure to do this will result in the formation of a femoral sac. Our common Mother will never be found carrying out a delicate evolution of this kind with monotonous infallibility, and she does frequently make femoral sacs in this way. One might have predicted with confidence that she would do so, even had we not observed that she does so. We might also be sure that her errors will not be stereotyped, but certainly subject to gradation and variations.

Femoral sacs vary in size, and their size would appear to be dependent on the length

¹Brit. J. Surg. 1925 4, xi 455-475²Brit. J. Surg. 1923 12 November

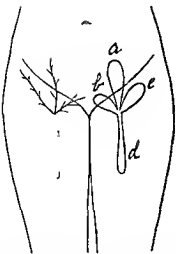


Fig. 1. On the left side are depicted the various positions assumed by large femoral sacs. They are rare *a* and *b* have been seen by the author once only *c* more than once in varying degrees *d* never. Brief histories of *a* and *b* *a* a young woman duration of hernia 9 years. When she stood up the sac filled with fluid. The sac was removed in 1901 in 1907 there was no sign of recurrence. *b* a stout man aged 36. The hernia had been regarded as inguinal and treated with a truss which was of course inefficient the fact that it was femoral was only discovered at the operation which consisted simply in removal of the sac. This was done in 1902. He died 19 years later. There was no recurrence.

of time during which they are in process of formation. The earlier their start and the longer their period of developmental change the larger their eventual size. It is convenient for purposes of description to divide them into three classes large intermediate and small.

Class I Large These are such as are portrayed in the diagram (Fig. 1). Their distinctive features are (1) rarity (2) position, (3) size. From these facts it is easy to deduce that they have the earliest possible origin that their origin synchronizes with the origin of the branches of the femoral artery and that they assume the identical positions which characterize those arteries because they are subject to the same developmental happenings.

Class II Intermediate These furnish the infrequent cases of femoral hernia seen in a children's hospital. They start and form later than Class I, and they consequently are neither so large nor do they assume the same positions. They are rare, but less rare than

the larger sacs. Examples of both Class I and Class II would of course be present at birth but they are too infrequent to make a search for them a rational undertaking.

Class III Small These are by far the most common and the question is when and how do they arise. I can see no reason for doubting that their origin is exactly the same as that of the two preceding varieties and that their smallness is in direct relation with their lateness in appearance. Given the underlying conditions that will be effective in the production of a femoral sac it is not difficult to understand that at birth they may not have produced a sac that can be detected and that being so there is still plenty of time between birth and adult life for the sac to become evident more especially at the period of puberty.

Sir Arthur Keith has examined the bodies of 500 infants and has found no trace of a femoral sac in any of them, and he regards this as conclusive evidence that my contention is thereby proved to be mistaken. To this I reply *non sequitur* the point at issue is whether the sacs found in adults are created by pressure from within the abdomen as he maintains or whether they are of developmental origin and a necessary precedent condition to femoral hernia as I maintain. Any one who has grasped the meaning of the above description that I have offered of the formation of femoral sacs will understand that to examine the bodies of 500 infants would be a hopeless task.

In the search for an example of either Class I or II 500 bodies would be a wholly inadequate number it would have been an extraordinary chance had such an example been found. There will then remain Class III and these as we have seen are not necessarily present at birth but make their appearance during the later years of growth between birth and adult maturity.

Therefore the fact that Sir Arthur Keith found no femoral sac in 500 bodies does not seem to be of any significance. I have however, always felt that although clinical observation is, alone and unaided, abundantly capable of demonstrating the saccular origin of femoral hernia, still it would be interesting

to find out just how much and how little the abdominal pressure is really capable of effecting in the absence of any pre existing sac in the femoral canal, and this very interesting and important evidence has, it seems to me, been supplied by Sir Arthur Keith himself, who has thereby set the coping stone upon the edifice of collected facts whereby the saccular origin of femoral hernia is demonstrated. Sir Arthur points out that people who have been subjected to long continued abdominal strain (he instances people who have suffered from chronic cough) develop little depressions at the femoral and other sites of hernia. I think this must be rather rare, but supposing it to be of frequent occurrence, what does it show? It will show that this is the maximum result in sac formation that can be got out of the intra abdominal pressure. This is in itself proof that the femoral sac cannot be formed in that way, because there is neither similarity nor clinical relationship of any kind between these little depressions and femoral hernia or the femoral sac. And thus suggests one or two questions, for instance. What proportion of people who have femoral hernia are sufferers from chronic cough, and how is it that such herniae are seen in young people without cough, and occasionally in children, and why is there no clinical relationship between specially laborious occupations and femoral hernia? Again a rule of three sum. If it takes x years of coughing to produce one of these little diverticula, how many years of coughing would be needed to produce one of the large femoral sacs shown in the diagram? And so on. Many such questions will occur to any surgeon who thinks the matter over.

In conclusion, it cannot be too strongly emphasized that the bedside and the operation room are the ultimate tribunal whether the lore of the laboratory and the dissecting room must come for judgment, and forgetfulness of this cardinal principle brings with it dangers to which we are all of us, clinical and research workers alike, peculiarly exposed.

If it is ever to be shown that the saccular theory of hernia is a chimera and a myth, it will have to be done by the study of hernia in the living, by operating surgeons and by them alone. Far be it from me to underestimate the immense value to science and to humanity of the work of so great an anatomist and philosopher as Sir Arthur Keith. But it must be clearly borne in mind that the function of laboratory work is to explain clinical facts, not to contest them, and should a decided conflict of opinion arise between the worker in the laboratory and the worker at the bedside, it would seem in the highest degree unlikely that truth will be found in the laboratory, and error at the bedside and the operation table.

In the early portion of this paper I alluded to a standard and uniform method of operating on femoral hernia of extreme simplicity, as the natural corollary of the saccular origin of this variety of hernia. Closure and abolition of the sac by separation and firm torsioning from below is in my opinion by far the simplest, safest, and best means of dealing with it. I have already dealt fully with this matter comparatively recently, may I therefore refer any who do me the honor to feel sufficiently interested, to my paper on femoral hernia published in the *British Journal of Surgery*, 1923, xi, No. 41.

CARCINOMA OF THE PROSTATE

A CLINICAL STUDY OF ONE THOUSAND CASES¹

BY HERMON C. BUMPUS, JR., M.D., F.A.C.S., ROCHESTER, MINNESOTA

Sect. on Urology

WHEN a physician has made the diagnosis of carcinoma of the prostate he is usually thoroughly questioned. The patient asks how long he has had the disease, how long he may be expected to live, what form of treatment will give the greatest amount of palliation, what particular type of suffering is likely to occur and innumerable other questions of a like nature.

It was to answer such questions with a greater degree of accuracy that I reviewed the 1000 cases of carcinoma of the prostate seen at the Mayo Clinic prior to January, 1925. Since the beginning of the use of radium in the treatment of these cases in 1915 careful follow-up records have been kept and I am therefore able to report complete records in 90 per cent of this series, a number sufficiently large to afford fairly accurate statistical data.

The average ages of these 1000 patients was 65 years, 495 approximately half had the disease between the sixtieth and seventieth year, in no case was it encountered before the forty-second year and in only four did it occur prior to the forty-fifth year. Therefore neoplasia of the prostate occurring prior to the age of 40 should be sarcoma.

SYMPTOMS AND COURSE

Initial symptoms. Accurate determination of the onset of the disease is difficult since its frequent association with benign hypertrophy makes the symptoms of urinary obstruction unreliable. Frequency and difficulty of urination were given as initial symptoms by 650 patients. It is noteworthy, however, that the next earliest symptom was pain (given by 156 patients). Such pain was undoubtedly due to metastasis, as it was most common in the back and thighs and shows how advanced the disease may be before any urinary symptoms occur. Retention, a common first symptom in cases of benign hypertrophy occurred in this

series but thirty-seven times and gross hematuria was never noted as a first symptom.

In 485 cases in which no form of treatment was given the average duration of the disease from the first symptoms to death was about 31 months. Obviously then any form of effective treatment must lengthen this period. When metastasis had occurred at the time of examination two-thirds of the patients died within 9 months. When careful examination indicated that metastasis had not occurred the average subsequent length of life was approximately one year but 38 per cent of the patients succumbed within that time.

In any large series of cases of malignant disease there are always a few patients who live many years. Thus in this series of untreated cases there are four patients who lived more than 3 years, two of them more than 10 years. Such cases are usually explained as errors in diagnosis but when the diagnosis is based on microscopic examination of tissue this explanation hardly holds. Thus in one of the cases a malignant metastatic inguinal lymph node was removed 10 years after the initial diagnosis of carcinoma of the prostate, a vivid illustration of the fallacy of attributing to any form of treatment all the favorable results obtained.

Subsequent symptoms. Like the initial symptoms the later symptoms associated with carcinoma of the prostate simulate those of benign hypertrophy. However the fact that the malignant enlargement soon becomes extracapsular while the benign enlargement does not, is shown by the fewer evidences of obstruction noted in cases of malignant disease. Thus the average quantity of residual urine in this series was but 180 cubic centimeters and the average amount of urea 43 milligrams for each 100 cubic centimeters of blood, almost within normal limits. While the phenolsulphonephthalein readings are not nearly so accurate a test, their average return of 32 per cent in 2

¹Read before the New York Academy of Medicine, February 1925.

Urological Association, New York, October 25, 1925.



Fig 1 Roentgenogram of a patient who had early metastasis to the sacrum



Fig 2 Extensive metastasis to the pelvis spine and femurs, showing increased density and destruction of bone

hours would be high for a similar number of cases of benign hypertrophy. The microscopic examination of the urine also shows how insignificant are the obstructive symptoms until late in the disease, for in 136 cases it was negative and in only 137 cases was gross hematuria noted, while in 362 cases erythrocytes were found on microscopic examination.

Metastasis to the lymphatic system. In 243 of the 1000 cases metastasis was demonstrable. In 44 per cent it had affected the lymphatics. The belief that carcinoma of the prostate does not readily invade the lymphatics is probably the result of a misconception of the true lymphatic drainage of the gland. Unlike the bladder, the prostate is rich in lymphatics which drain directly into lymph nodes situated along the internal and external iliac arteries. These in turn empty into nodes along the sacral promontory which drain into chains of nodes along both sides of the spine. It is evident, therefore, that involvement of the lymphatic system cannot be detected until it has reached the neck. Here the cervical and supraclavicular groups of nodes become involved. When this has occurred the disease must indeed be extensive, and yet in twenty-five patients (11 per cent) metastasis was evident in this situation. Occasionally, if the disease is far advanced, the affected nodes along the iliac vessels and spine become so greatly enlarged as to be palpable. In such cases there is usually marked interference with the lymphatic drainage of the lower ex-

trimities, one or both legs being edematous and brawny. This occurred in 34 cases (15 per cent of the cases of metastasis).

The inguinal nodes were involved in 44 cases (18 per cent of the cases of metastasis). These and the axillary nodes are usually affected late in the disease and are therefore of little diagnostic aid.

Metastasis to the osseous system. While the lymphatic system is without doubt the earliest and most frequent site of metastatic lesions, they are far easier to detect in the osseous tissue, for they are usually of the osteoplastic type, and the increase in the density of the bone renders them discernible by the roentgen ray. The most common site of involvement is the sacrum (Fig 1) and adjacent portions of the spine and pelvis. Sproule, who was able to make roentgenograms throughout the entire course of the disease, found that bony metastasis first occurred in this location, after which it spread to the spine and through the pelvis (Fig 2), finally appearing in the ribs and femurs, and just prior to death, in the humerus. In this series, 539 patients were examined roentgenographically and the pelvis found involved in 123, the spine in 107, making an aggregate of positive findings in approximately 25 per cent of the series. The femur was affected sixteen times and the ribs ten, but always in conjunction with pelvic involvement (Fig 3).

Early metastatic lesions are difficult to distinguish from areas of osteitis (Fig 4) and,



Fig. 3 Metastasis of carcinoma to femur and pelvis showing increased density with destruction of bone (compare with Fig. 5)

when the latter are found in the sacro iliac region in men of prostatic age the diagnosis should not be confirmed until careful rectal examination has ruled out the possibility of malignant disease of the prostate. A more frequent cause of confusion in the more advanced cases is the differentiation from Paget's disease (Fig. 5). In the latter the bodies of the lumbar vertebrae are flattened and widened and there is increased density without destruction while with metastasis there is little if any change in the shape of the vertebrae but the increase in density is associated with destruction of tissue. However as Carrman and Carrick have pointed out there is one means of making the diagnosis certain.

If the skull (Fig. 6) shows the pathognomonic changes of Paget's disease that is thickening and density of the inner table and the finely porous outer table with scattered nodules of bone over the vault the diagnosis of Paget's disease is certain.

Therefore in all cases of apparent metastasis to the bones in which malignant disease of the prostate has not been clearly demonstrated roentgenograms of the head should be made before a positive diagnosis is pronounced.

Metastasis to the lungs. In 46 cases roentgenograms were made of the lungs (Fig. 7)



Fig. 4 General osteitis of the pelvic bones easily mistaken for malignant metastasis but showing increased density in fine radiating lines and no destruction of bone

and in twelve metastatic growths were discernible. In all of these metastatic tumors were present in the spine or pelvis. Therefore for diagnosing the presence or absence of metastasis by the roentgen ray a plate including the spine pelvis and upper femurs would seem all that is necessary.

Metastasis to the spinal cord. Eleven patients had metastasis to the spinal cord which resulted in symptoms simulating tumor of the cord with more or less paralysis prior to death. Several of these had no urinary symptoms the pain and paralysis being the initial and sole complaint the malignant disease of the prostate being discovered during the general physical examination.

At times even when the cord itself is not affected the disease in the lymph nodes causes much pressure on the spinal nerve roots with girdle pains and symptoms of sciatica or rheumatism. When such symptoms develop during the age of prostatic disease the possibility of the pain being due to malignant disease rather than infection must not be overlooked especially when it is recalled that in this series pain was given as the third most frequent initial symptom occurring in 15 per cent of the cases.

Metastasis to other parts. Metastasis may affect any part of the body. In this series the skin the liver and the kidneys were affected in several cases.



Fig. 5. Paget's disease showing only increased density of bone

TREATMENT

In the treatment of these patients two problems are encountered the correction of the obstruction and the treatment of the malignant lesion itself

Surgical Of 178 cases in which prostatectomy was performed there are completed records in 164 (92.1 per cent). In 47 a perineal operation was performed and in 117 a supra pubic. The length of life following operation averaged 30 months for the group nearly three times as long as when no treatment was given. Thirty five of these patients are still alive but half have not lived 3 years of the 17 others twelve have lived more than 5 years and may be considered cured. Yet when it is considered that in many of these cases the malignant disease was so recent as to be discovered only at operation after the gland had been removed for supposedly benign hypertrophy, the results are indeed poor even with the addition of 9 cases in which death occurred more than 5 years after prostatectomy. In all there were 21 five-year cures in 164 cases. This figure should make one hesitate to recommend surgical treatment when the disease has advanced sufficiently to be positively diagnosed.

By radium Because of these poor surgical results operation was abandoned at the Mayo Clinic in cases of malignancy of the prostate



Fig. 6. Skull in case of Paget's disease showing thickening and density of the inner table and the highly porous outer table with scattered nodules of bone over the vault, pathognomonic of this disease

with the advent of radium treatment in 1915. At first the method of administration of radium was necessarily crude. In 35 cases it was given in the rectum directly over the prostate



Fig. 7. Metastasis of carcinoma of the prostate to the lung

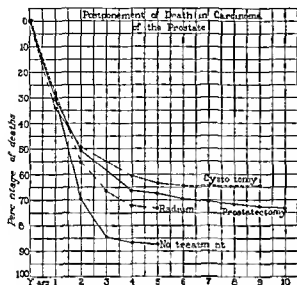


Fig. 8 Postponement of death in carcinoma of the prostate after various procedures

in an endeavor to irradiate the gland through the rectal mucosa. When it is considered that the amount of radium rays decreases in inverse ratio to the square of the distance it is apparent how much radium radiation reaches the sensitive rectal mucosa and how little reaches the deeper underlying malignant neoplasm by this method. It is not surprising therefore that of the 35 patients so treated all but one are dead and that many suffered severely from proctitis as a result of the treatment.

With the introduction of radium bearing needles by Barringer the rectal treatment was abandoned and the radium was delivered directly into the growth by needles plunged through the perineum. Thirty-five patients were treated by this method but only three are alive. The average length of life for the group was 16 months after the application of radium, very little longer than for the patients that received no treatment.

Necropsy in the fatal cases at the clinic showed that the destruction of tissue had been extreme in the neighborhood of the needles but in other parts of the gland the cancer was unaffected.

If radium treatment was to be successful it was apparent that the gland would have to be irradiated more thoroughly. Therefore in

subsequent cases the radium was applied through the urethra by means of emanation bearing seeds inserted directly into the gland as well as through the perineum and over the rectal surface. Of the 122 patients so treated there are completed records of 112. The dosage given averaged a little in excess of 2000 milligram hours and the patients lived an average of 22 months following their treatment. Of these 25 are still living, 9 more than 3 years, 4 of whom have lived more than 5 years. These results are about equal to those obtained by the surgical treatment considering that these cases were not as carefully selected. Just as the surgical results did not warrant the continuation of that form of treatment except in selected cases so the results of radium treatment compelled its abandonment.

By the combined method. In a few cases, prostatectomy was performed following irradiation of the gland with radium. The results were so poor and the technical difficulties of excising a gland previously irradiated so great that it was quickly abandoned. In other cases radium was given following prostatectomy if the pathological examination showed little involvement. Here I believe is the greatest field of usefulness of radium in connection with malignant disease of the prostate. By the thorough irradiation of the prostatic capsule and seminal vesicle the lymphatic drainage is destroyed and metastasis to the iliac lymph nodes may be prevented if it has not already occurred. Moreover, the resulting scar tissue encases any malignant areas that may remain and tends to keep them localized. If such are discovered, adequate perineal exposure will permit the exact application of many radium bearing needles or emanation seeds directly into the recurrent neoplasm which is the surest method of destroying it. Such an exposure makes the neoplasm a surface lesion and as radium treatment has been successful in proportion to the accessibility of the neoplasm treated, it offers the greatest possibility of cure. Patients so treated it is hardly necessary to add should report regularly for examination in order that recurrence may be discovered early.

Treatment of obstruction. If there is but little residual urine as is usually the case

until late in the disease the daily use of a catheter to remove it will probably be sufficient to maintain adequate renal function. If the obstruction is more severe and a catheter passes with difficulty, cystostomy is the indicated procedure. This was performed in 125 cases in this series, of which there are complete records of 117. The average duration of the disease was nearly twice as long being 57 months instead of the usual 30 months for patients who received no treatment. After operation these patients lived an

average of 24 months, more than twice as long as the patients for whom cystostomy was not performed. Thirty-four are still alive, 11 more than 3 years since their operation of whom 6 have lived more than 5 years. These cases may represent mistakes in diagnosis, but error should be no greater in this group than in the group treated with radium. No other form of treatment has proved as free from risk, caused so little suffering or so lengthened life as suprapubic cystostomy (Fig 8).

CALCIFIED HYPERNEPHROMA OF THE KIDNEY¹

REPORT OF A CASE DIAGNOSED BY X-RAY EXAMINATION, WITH A
DISCUSSION OF THE DIFFERENTIAL DIAGNOSIS OF RENAL SHADOWS

BY AARON ARKIN, A M., PH D M D, CHICAGO

PROGRESS in X ray diagnosis of kidney disease has been by very rapid strides since the discovery of pyelography and the development of improved technique in the photography of the kidney. Until recently, however, these roentgenological methods have been employed chiefly for the diagnosis of renal calculus. On this subject a very extensive literature now exists and it has been found that over fifty conditions other than kidney stones may cause shadows in the kidney region. The fact that so many errors are possible in the roentgenological diagnosis of renal calculus has led to a more careful study of the nature and localization of shadows in the kidney region. The surgeon and the pathologist have disclosed certain diseased conditions of the kidney which can be demonstrated by X ray examination. These I shall briefly discuss because of their importance in the differential diagnosis of the case of calcified hypernephroma which I wish to report. The various extrarenal shadows which may be confused with kidney stones do not concern us here.

In a study of the roentgen, surgical and urological literature I have been unable to find a case of calcified hypernephroma of the

kidney diagnosed by the X ray. However, experience with the postmortem examination of a considerable number of hypernephromata and a review of the literature on the pathology of hypernephroma have led me to believe that this diagnosis will be made in the future. The hypernephroma is a tumor which may be present for years before making itself known to the patient, and during this long course frequently undergoes retrogressive changes such as I shall describe. Calcification, or even metaplasia to bone tissue, is seen quite often in hypernephroma and makes possible a direct demonstration of the tumor in an X ray photograph or even with the fluoroscope as in the case which I wish to report.

THE ORIGIN OF HYPERNEPHROMA

There is still much difference of opinion in the literature about the origin of the so called Grawitz tumor or hypernephroma, or hypernephroid (Lubarsch). Grawitz came to the conclusion that the tumor originates from misplaced rests of adrenal cortex in the kidney, and this view was accepted by most pathologists. In recent years studies by a number of investigators and especially by Stoerk, have cast doubt upon the Grawitz theory. Stoerk

¹From the First Medical Clinic (Prof. K. F. Wenckebach) of the University of Vienna.



Fig 1 Roentgenogram of calcified hypernephroma of the left kidney showing compression of the greater curvature of the stomach with hourglass deformity of the stomach



Fig 2 Roentgenogram of calcified hypernephroma of the left kidney with pyelogram of the left kidney pelvis filled with sodium bromide solution (side view). The calcified shell and lobulated structure of the tumor can be well seen here also the marked changes in the renal pelvis

believes that the hypernephroma is not an adrenal but a renal tumor originating in kidney tissue. He claims to be able to demonstrate transition stages from small renal adenomata to hypernephroma. For a discussion of this subject I can recommend the new publication on pathology of the kidney by Henke and Lubarsch in their *Handbuch der speziellen Pathologie und Histologie* or Israel's new book on surgery of the kidney.

We find in the kidney quite often simple or benign small hypernephromata which have a characteristic yellowish color and may occur in any part of the kidney, lower as well as upper pole. Then we have the destructive or malignant type of hypernephroma. The structure may resemble the zona fascicularis of the adrenal (typical hypernephroma). These most likely originate from misplaced rests of adrenal cortex in the kidney. There are also atypical hypernephromata of the mixed tubular type which can perhaps be most easily explained as inclusions of kidney tissue in the misplaced adrenal portions. In a certain percentage of malignant atypical hypernephromata it is at present difficult to say what their origin really is. The occurrence of sarcomatous areas in hypernephroma may be considered the result of the presence of mesenchymal tissue in and about the adrenal rests.

If we assume that a large percentage of hypernephromata originates as adrenal rests in the kidney or even if we accept the renal origin, we in either case are unable to explain the very interesting fact that malignant hypernephroma very rarely occurs in children. It is almost exclusively a disease of middle or old age. Albrecht gives the average age at 48, his youngest patient being 28 years old. Steffen, who collected 228 cases of malignant tumors of the kidney in children, does not mention hypernephroma. Even as late as 1900 Burkhardt stated that no cases of hypernephroma had been reported in children. I ranck in 1910 reported one case and was able to find three others in the literature (Bjerring and Albert MacCarty, Clairmont).

The fact that we so frequently find small benign hypernephromata in the kidney post mortem indicates that only a small percentage of these tumors becomes malignant. This transition to malignancy is brought about by unknown factors usually after the fortieth year of life. As we shall see when we discuss the changes occurring in hypernephroma and the long course of the disease in some cases the disease may, however, cause definite symptoms dating back for years as long as 40

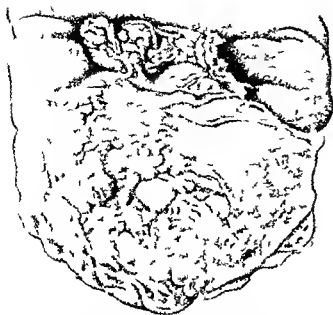


Fig 3 Drawing showing the surface of the left kidney removed at operation. The nodules of hypernephroma can be well seen projecting beyond the surface of the kidney.

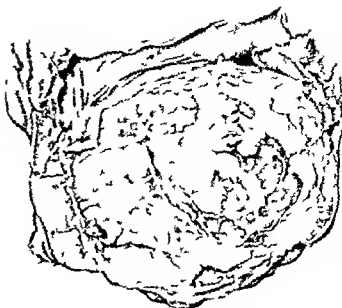


Fig 4 Cut surface of the left kidney containing the large calcified and partly ossified hypernephroma. The lobulated structure with cystic degeneration and areas of blood pigment deposition can be seen also the fresh nodules of hypernephroma outside the calcified shell. The compressed and elongated pelvis is seen in the upper part of the drawing.

years. And even after decades of apparent harmlessness the tumor may suddenly become malignant and cause death. This change to malignancy may occur as in the case reported by me even after the tumor has undergone very extensive retrogressive changes with calcification and metaplasia to bone tissue. We may conclude then that hypernephroma is a common tumor of the kidney which is usually benign and grows very slowly or not at all. It frequently undergoes marked degenerative changes. Yet it is always potentially malignant. This malignancy in hypernephroma is characterized by a marked tendency to invade the renal veins and produce solitary or multiple metastases chiefly in the lungs and osseous system.

I wish to call attention to a peculiarity of malignant hypernephroma which is of great importance. It may produce a solitary metastasis in a bone and after removal of such a metastasis the patient may live for many years. The primary tumor in the kidney may be quiescent, yes even unrecognized, and yet a bone metastasis occur. Hence the possibility of hypernephroma should be kept in mind in every case of bone tumor. The early development of bone metastases in a case of tumor of

the kidney speaks for hypernephroma. Such metastases have also been seen a long time after the removal of the primary tumor in the kidney. Albrecht reports a case with metastases 10 years after operation for hypernephroma.

SYMPTOMS OF HYPERNEPHROMA

The cardinal symptoms of hypernephroma are hematuria, pain, and a palpable tumor of the kidney. In the early stage, or in the benign type, none of these symptoms may be present. We have already called attention to the frequent occurrence in the kidney of small well encapsulated benign hypernephromata.

Hematuria usually results from the invasion of the renal pelvis or one of the calyces by the tumor, and therefore as a rule indicates the malignant character of a hypernephroma. However, hematuria very often occurs as the first symptom in hypernephroma and is usually intermittent. It may be accompanied by attacks of renal colic due to obstruction of the urinary passage by blood coagula. The intervals between the attacks of hematuria may be very long, even years. Or the hematuria may entirely cease after a few attacks.

Richard Weil has reported a case of hypernephroma in a man of 56 whose first attack of hæmaturia occurred 40 years before operation. Kraft has published a case with a history of 35 years' duration. In the case of calcified hypernephroma reported by me the patient had her first attack of hæmaturia 16 years before she came to the hospital. The fact that hypernephroma can produce hæmaturia years before it causes any other signs of malignancy makes it very important to investigate every case of renal hæmaturia which is not due to nephritis or calculus. We have seen that in some cases the hæmaturia dates back to early youth when a correct diagnosis would enable the surgeon to cure the patient by a nephrectomy. In fact an exploratory operation in a case of one sided hæmaturia may be in some cases indicated to determine the presence of a hypernephroma.

RETROGRESSIVE CHANGES

Degenerative changes are usually present in hypernephroma. The extent of the changes varies with the size and rate of growth of the tumor. In most large tumors we find areas of necrosis and hæmorrhage with deposition of hæmosiderin. The hæmorrhage may be so marked as to cause a rapid increase in the size of the tumor, a not infrequent characteristic of hypernephroma. The patient will state that he suddenly felt a tumor mass in the kidney region which grew rapidly in the course of days or weeks. The tension upon the renal capsule or pressure upon the surrounding structures often gives rise to severe pain. These areas of hæmorrhage may then resorb and leave large pseudo cysts. When the tumor is medullary in type that is contains little connective tissue then a single large pseudo cyst may form as a result of necrosis and cystic degeneration. If it is of a scirrhus type with numerous septa of connective tissue dividing the tumor mass into separate lobules of tumor cells then the growth may present a variegated appearance on the cut surface. We see masses of yellow or whitish hypernephroma tissue, areas of fresh hæmorrhages and many small and large cystic cavities lined with a brownish pigment (hæmosiderin) or with organizing blood clots loosely

attached to the walls. Some of the cavities produced by necrosis of hypernephroma contain large amounts of cholesterol. The dense connective tissue capsule with its septa extending into the tumor mass may then undergo marked hyaline change, calcification or metaplasia into bone tissue. These changes explain the X ray picture of hypernephroma in the case which I shall report.

Even with the marked degenerative changes described above careful histological examination will still reveal areas of hypernephroma and thus enable the correct diagnosis to be made. As examples I shall cite a few interesting cases which I have found in the literature.

Weil in 1908 described a distinct type of hypernephroma which simulates various cystic conditions and reported one case. The patient a man of 56 had a large cyst of the kidney which contained a gelatinous fluid rich in cholesterol crystals and blood pigment. The kidney tissue was reduced to a thin shell. The tumor presented the appearance of a hæmatohydronephrosis. Careful examination revealed two small areas of hypernephroma. The patient had had his first attack of hæmaturia 40 years previously, at the age of 16 years. The so called cyst was a slowly growing hypernephroma with cystic degeneration following hæmorrhage.

It is quite possible that some of the "blood cysts" of the kidney reported in the literature belong here. Two such cases were described by Etcheverry in 1905. Kroenlein and Wyss described a cyst found in the kidney of a woman 37 years old. It was surrounded by a wall of bone tissue and contained only blood clots and cholesterol crystals.

A very interesting case was published by Fabricius. He operated upon a man 55 years old with a cystic tumor of the kidney the size of a child's head. The tumor had a dense sclerotic fibrous capsule and was filled with a reddish brown fluid which contained some blood clots and cholesterol masses. An examination of the specimen by Professor Ghon revealed a few small rests of hypernephroma cells in the almost completely degenerated tumor. In the connective tissue capsule some calcification and bone tissue formation had

occurred. The patient was reported well 12 years after the operation.

Albrecht in his excellent publication on hypernephroma describes one case (No 25) with changes similar to those seen in the case reported by me. Had this patient been X rayed the picture would have very closely resembled the one presented by me. The woman, 58 years old, was in good health until a few months before the operation when she discovered a tumor mass in the left hypochondrium. In the left kidney Albrecht found two tumor masses in the lower pole. The smaller mass, nearer the pelvis is surrounded by a hard fibrous and partly calcified capsule. The larger mass in the lower pole of the kidney is enclosed in a calcified, and in part, ossified capsule. The specimen was sawed in two, as it could not be cut with a knife. The larger cyst is filled with a yellowish to brownish red mass rich in blood pigment and cholesterol. This tumor was no doubt years or decades old. The smaller tumor mass contained typical hypernephroma areas.

Another case of interest to us is the one described by Kraft under the title "Selbstheilung bei Hypernephrom." I do not consider this title well chosen, because, as we shall see, we can never really consider a hypernephroma "healed." Nevertheless the case illustrates very well the point which I wish to emphasize, and that is. A hypernephroma may undergo very marked degenerative changes over a period of years, remain apparently benign, and calcify or even ossify, it may escape a correct diagnosis unless a careful histological examination is made of various parts of the growth.

Kraft's case of so called healed hypernephroma occurred in a man of 46 years. At the age of 9 he had some discomfort and pain in the kidney region. At 17 he lost in weight and strength and the pain increased, at this time a diagnosis of Bright's disease was made because of the presence of albuminuria. At 19 the patient had severe pain, with fever and chills and marked hæmaturia and pyuria. After the passage of considerable purulent bloody urine the fever gradually disappeared. Then came severe neuralgic pains radiating from the kidney region toward the bladder

and left thigh. Atrophy of the left thigh set in at the age of 23. Between the ages of 24 and 36 the patient had four attacks of hæmaturia and renal colic. In 1916 a diagnosis of polycystic kidney was made with the finding of a nodular tumor in the left kidney region. Operation was performed in 1917.

A large tumor of the upper two thirds of the left kidney, with two large orange sized cysts was found. These contained a reddish brown fluid and blood clots. The right kidney and the liver were found to be normal. Histological examination of the cysts by Professor Maresch revealed the interesting fact that no epithelial lining was present, hence the nature of the two cysts could not be stated. In 1918 the patient again developed attacks of colic and another tumor mass was palpated in the left kidney region. In 1919 the left kidney was removed. In the upper pole and hilus region a cystic tumor was found. It had a thick capsule and contained many smaller cysts with blood pigment in the walls. Some of the areas were characteristic hypernephroma masses. There were all transitions from lobules of tumor cells to cysts.

From this case we can see that a hypernephroma may be present for 40 years and undergo such marked degeneration and pseudo cyst formation that no tumor cells can be found. Yet it may possess the ability to recur with the formation of typical hypernephroma masses after removal of the cysts.

Leopold in 1883 reported a case of huge cyst of the kidney containing 4 liters of a bloody, thick, fluid mass. The cyst had a thick capsule and was sharply separated from the kidney. It contained blood coagula and pigment. This cyst may have been a degenerated hypernephroma. As I have already stated other cases of blood cyst probably belong in this group. William Israel has also reported a case of hypernephroma with extensive pseudo cyst formation. While studying the literature on kidney tumor I found one other case which I wish to mention here. Brugnattelli in 1911 reported a case of so called mixed tumor of the kidney with osseous tissue which I consider a hypernephroma with metaplasia into bone tissue. The woman of 43 had a tumor of the right kidney which was operated upon.

Brugnatelli describes the tumor as consisting of a main portion of spindle cell sarcoma, with cells resembling megakaryocytes scattered through it an epithelial portion with tubular structures and groups of polyhedral cells and a part containing bone tissue. He also found an area of typical hypernephroma.

Unfortunately none of the above cases was X rayed so that we at present have no knowledge of the roentgen findings in these old degenerated hypernephromata. But I think the report of the above cases shows us that hypernephromata may grow very slowly produce pseudo cysts or calcify and even ossify.

Not only may the primary tumor in the kidney undergo these changes but also the metastases in various parts of the body. A hypernephroma metastasis in a bone may reach a certain size and then undergo similar pseudo cystic degeneration or hæmorrhage and a false diagnosis may result. Albrecht mentions a case in which Kolisko saw in the brain tumor cysts containing blood. He found them to be hypernephroma metastases which Neusser had looked upon as brain hæmorrhages. I have seen a similar case of brain pseudo cysts produced by metastasis from a bronchus carcinoma, which by undergoing cystic softening showed only a very thin layer of carcinoma cells in the wall of the brain cyst.

In metastatic bone tumor it is always necessary to look to the hypernephroma, thyroid, breast, prostate and bronchus for the primary growth. In a patient with hypernephroma a solitary bone metastasis or multiple lung or bone metastases may be the first sign of the existence of the tumor of the kidney. Perhaps we shall be able in some such cases to obtain evidence of the presence of hypernephroma with the X ray.

THE X RAY DIAGNOSIS OF HYPERNEPHROMA

The roentgen ray is of great value in the localization of kidney tumors. For the examination of a case of suspected renal tumor we have several means at our disposal: (1) photography of the kidneys, (2) pyelography, (3) pneumoperitoneum, (4) perirenal injection of oxygen gas (Rosenstein), and (5) examination

of the colon and stomach for dislocation (Sterlin).

The X ray findings in a tumor of the kidney are very variable. A small tumor will as a rule give no positive findings unless it is calcified. On the other hand large tumors may be directly visible in photographs. They are characterized by a more or less irregular or nodular shadow which becomes continuous with the kidney shadow or occupies the kidney region. Tumors of the upper pole are more difficult to demonstrate than those in the lower pole. When the tumor shadow is visible in the X ray plate then the diagnosis is assured. Occasionally a tumor presents the picture of a stone when it is calcified or when as in Groszlik's case a calcified blood clot is present. A number of cases of stone and tumor have been reported (McCormac, Dickenson, Walsham, Israel, Nicolich and Nogues). These have mostly been carcinomata. Perhaps the stone plays the same rôle in carcinoma of the renal pelvis as does cholelithiasis in carcinoma of the gall bladder.

When a tumor grows in the parenchyma of the kidney and toward the renal pelvis it produces changes in the position, size and shape of the pyelogram. The calyces may be compressed to form narrow slits or pushed in various directions depending upon the location of the tumor. Or one or more of the calyces may become distorted or enlarged. The pelvis is sometimes reduced to a narrow slit or divided into isolated recesses. A filling defect may even be visible in the pyelogram.

The entire renal shadow may be enlarged. There may be variations in the density of the shadow. Often the tumor casts a more distinct shadow than the normal kidney. Large kidney tumors may lead to ptosis of the affected kidney.

ROENTGEN FINDINGS IN OTHER KIDNEY DISEASES

The following kidney diseases have been described as producing changes in the roentgenogram: (1) tuberculosis of the kidney, (2) hydronephrosis and pyonephrosis, (3) perinephritis, (4) paranephritic abscess, (5) cystic kidney, (6) calcified blood clot in the pelvis, (7) bilharzia, (8) calcified aneurism of

renal artery, (9) tumors of the kidney, and (10) calculi

TUBERCULOSIS OF THE KIDNEY

We can differentiate four types of renal tuberculosis from the roentgenological standpoint (1) tuberculosis of the kidney without X-ray signs, (2) chronic ulcerative or "canal" tuberculosis of the kidney (pelvis, calyces, ureter), (3) cement kidney "*Kitt-niere*" "*Moerlel-niere*"), and (4) calcified tuberculosis of the kidney, bealing tuberculosis

In the first type the early stage of tuberculosis, the X-ray will reveal no changes as a rule. When the renal pelvis and calyces are not yet deformed the pyelogram will also be normal. In such cases of early hematogenous tuberculosis the urine will often contain bacilli long before the X-ray findings are positive. In fact quite extensive tuberculous destruction may occur without roentgenological signs when the renal pelvis and calyces are not markedly destroyed and the tuberculous tissue still has the consistency or density of the normal kidney tissue. When a tendency to heal occurs and calcium is deposited or the caseous mass increases in density then a shadow will be cast. In some cases changes in the bladder or ureter make pyelography impossible.

In the ulcerative form of tuberculosis the pelvis becomes altered in the pyelogram. It is irregular, the calyces are enlarged. The kidney shadow may become enlarged, or, in the advanced stage, smaller due to shrinkage and atrophy. Or the picture may resemble closely that of a hydronephrosis with a large sacculated pelvis and a lobulated outline of the greatly thinned kidney parenchyma. In such advanced cases in young persons a compensatory enlargement of the unaffected kidney occurs. The roentgen findings in the so-called "*Kitt-niere*" or "*Moerlel-niere*" have been described by Oehlecker, Koehler, Lichtenberg and Dietlen, Soederlund, and others. In these cases pyelography is often impossible on account of advanced bladder changes or occlusion of the ureter. Characteristic shadows of a hemispherical or clover leaf shape appear in the kidney. The ureter may be greatly dilated, or appear as a spindle-shaped shadow

in the psoas region. There are at times large homogeneous shadows at the kidney poles, with a peripheral darker calcified zone in the cortical region. The X-ray picture may resemble closely a hydronephrosis, looking like a kidney with dilated pelvis and calyces filled with a contrast mass. A plaster-like or doughy mass fills the calyces and pelvis in such cases. The whole urinary canal system of the pelvis, calyces, and ureter may be affected, hence the name "canal" tuberculosis. In the advanced stage the entire kidney may consist of a dilated lobulated thickened capsule filled with such a caseous mass. Or the kidney may become shrunken and atrophic. As a rule some calcium deposition is seen in the walls of the large cavities in the form of small spots or stripes in the cortex.

In calcified tuberculosis of the kidney we may have a bealing "*Kitt-niere*" or a localized tuberculosis with calcification. Therefore this form of tuberculosis may be mistaken for a renal calculus. I have already stated that the "cement" kidney often contains calcium deposits at the periphery of the masses which have a characteristic hemispheric or clover-leaf shape. The calcium is usually deposited irregularly in spots or stripes increasing toward the periphery. The calcified areas have a less sharp contour than kidney stones and are usually more permeable to the rays. Such cases have been reported by Soederlund, Haudek, Levy-Dorn, Graessner, Dietlen, Holland, Neuhaeuser, and others. I have seen the roentgenogram of such a case, with bilateral involvement.

Soederlund reported 3 cases in which the X-ray photograph enabled him to localize definitely the tuberculous process. Catheterization was impossible in all 3 cases. De Witt reported a case of clinically healed tuberculosis of 15 years' duration in which he could demonstrate three calcified areas in the kidney.

It must not be forgotten, however, that calculus may occur in a tuberculous kidney. A number of such cases has been reported. The differentiation between stone and tuberculosis is as a rule not difficult, though now and then a case occurs in which differentiation is impossible from the X-ray examination.

alone. The shadows of tuberculosis are not so sharply outlined as those of stones; the borders are indistinct and often go over gradually into the surroundings. There are often radiary stripes or small spots of calcium at the periphery. The changes also are more marked in the parenchyma of the kidney, whereas stones are usually seen in the pelvis and calyces.

Dietlen and also Noesske reported cases which led to a mistaken diagnosis of stones. In Dietlen's cases there were small sharply outlined shadows in the lower kidney pole. Noesske's case presented shadows in the pelvis region with extensions toward the periphery such as often occur in large calculi.

Graessner has published a very interesting case of tuberculosis of the kidney and ureter with marked enlargement of the ureter and calcification in both kidney and ureter.

In the calcified form of tuberculosis the prognosis is as a rule better than in the "Kitt niere" (Fenwick) type as the calcification indicates a marked tendency to heal.

HYDRONEPHROSIS AND PYONEPHROSIS

I shall not discuss the characteristic λ ray findings of these conditions but refer the reader to the excellent publications of Baensch and Boeminghaus, Burchard, Dietlen, Eisler, Frank and Glas, Rubaschow and the text books on roentgenology. I wish here only to call attention to the possibility of calcification of the kidney in hydronephrosis and pyonephrosis. Such cases have been reported by Goldenberg, Bauer and others. Goldenberg's case was diagnosed as bilateral nephrolithiasis. Nephrotomy showed hydronephrosis with calcification in the wall of the pelvis and no stones. Bauer's case was one of a large hydronephrotic and partially calcified kidney.

PERINEPHRITIS

Changes in the renal capsule, inflammatory or neoplastic, may produce changes in the λ ray picture of the kidney. Tumors of the kidney capsule, most often fibromata, myomata or mixed tumors, may undergo hyaline change and calcification and produce a definite shadow. I have seen such cases postmortem, but know of none reported in the roentgen literature.

Kraft reported a case presented by Perussia at the Roentgen Congress in Palermo, in which a partial calcification of the renal capsule was diagnosed as a stone in the kidney.

The renal capsule may undergo thickening with connective tissue or calcification, after a perinephritis or paranephritis and cast a shadow with the λ ray. Rovsing described 4 cases of fibrous perinephritis in patients with uric acid diathesis with a characteristic disease picture. The patients complained of nephralgia and had occasional hematuria during the attacks of pain. The urine was rich in uric acid and urates. Operation revealed a thickened capsula propria with adhesions and firm fixation of the capsule to the kidney tissue. The capsule was greatly thickened as a result of a sclerosing fibrous perinephritis. Rovsing explains this change as being due to the uric acid, similar to the arthritis urica. More recently Ilyes has reported 3 similar cases. He found the same thickened capsule containing uric acid crystals. One case showed with λ ray three irregular shadows in the kidney region due to the capsule changes. Removal of the affected areas of renal capsule gave relief.

Scars in the kidney tissue may cast a shadow (Baetjer Smart) as may also thickening of the capsule or calcification of the capsule after perinephritis or paranephritis. Koll reported 4 cases of paranephritic abscess with positive λ ray findings. He obtained distinct abnormal shadows in the kidney region which, together with the clinical symptoms, led to the correct diagnosis in all 4 cases.

Here I might also mention a case reported by Heinecke. A patient with sarcoma of the fibula developed metastases in the perirenal fat tissue of the left kidney. The λ ray gave an irregularly outlined compact dense structureless shadow in the kidney region.

CYSTS OF THE KIDNEY

The λ ray may be of value in the diagnosis of congenital cystic kidney, which is practically always bilateral. Here pneumoperitoneum may aid in determining the size and form of the kidney. The cysts may produce distinct shadows in the λ ray plate, or change the form of the renal pelvis. Haenisch reported a

case of a cyst 6 centimeters in diameter in the upper pole of the kidney of a man of 65. An almost circular sharply outlined shadow of homogeneous density was found by X-ray. Revesz reported a very interesting case of nephrolithiasis with several unusually large round disc shaped stones, which led to the X-ray diagnosis of echinococcus cysts of the kidney. Kidney cyst may produce a round sharply outlined shadow with a darker border (Barjou). The cyst wall may undergo calcification. Echinococcus cysts rarely occur in the kidney. They may produce a homogeneous sharply outlined round shadow.

ANEURISM OF THE RENAL ARTERY, ETC

Key and Akerlund have described a case of calcified aneurism of the renal artery. The small aneurism cast a characteristic crescent shaped shadow in the pelvis region. I might also add here the report of Lotsy on *bilharziosis* diagnosis by the X-ray. He has described the findings in the bladder, and more recently a case of *bilharzia* of the renal pelvis and ureter. A round shadow with a darker border and two parallel linear shadows running downward from the pelvis toward the ureter was found. Calcification of the adrenal may occur in Addison's disease. Such a case has been reported by Rolleston and Boyet. Such a shadow might be mistaken for a stone. Groszlik has published a case of calcified blood clot in a carcinomatous kidney which gave the roentgen picture of a calculus and was diagnosed as such.

REPORT OF A CASE OF CALCIFIED HYPERNEPHROMA

The case which I wish to report is one of a calcified hypernephroma of the left kidney in a woman of 49 years. The tumor was found by fluoroscopy, and the diagnosis of calcified hypernephroma was made from the X-ray examination and clinical findings. The diagnosis was confirmed at operation.

The patient, M. C., is 49 years old, married. Her father died at the age of 38 of pulmonary tuberculosis. The mother died of a chronic disease, nature unknown. Three brothers and sisters died of tuberculosis between the ages of 6 and 19 years. The patient had measles in childhood. Her menstruation

began at 14 and usually lasted 8 days and was profuse but regular. In 1906, at the age of 31, the patient gave birth to her first child, and shortly thereafter developed pain and a dragging sensation in the left kidney region. She was for a time unable to raise her left leg. The physician attributed her trouble to the difficult labor. She was sent to a hospital for a time, and 6 months later the symptoms on the left side subsided after the patient received a special corset for a floating left kidney. In 1909 she had her second child, and shortly thereafter developed two attacks of renal colic on the left side. The first attack lasted 6 hours and was followed by passage of bloody urine. The second attack which came a few months later, lasted 12 hours and was again followed by marked hæmaturia. In 1911 the patient had her third child.

She felt well from 1909 until 1914 when she developed a right sided pleurisy. From this she recovered after about 4 months. Since this attack of pleurisy she has had repeated night sweats, often so severe that she has been obliged to change her night clothes. In 1916 she had a sudden attack of severe pain in the left side while washing clothes. She went to bed immediately. The pain disappeared after a week.

In June 1923, she had attacks of pain in the right side of the abdomen which usually disappeared in a few hours. At the same time she developed a *feeling of pressure in the stomach after meals*. In September 1923, she complained of a constant feeling of pressure under the left costal margin in the region of the stomach, and pain in the back on the left side with considerable loss in weight and hæmaturia.

I saw the patient for the first time at the Wencke back Clinic on September 4, 1923. She was sent to the roentgen laboratory for a fluoroscopic examination of the stomach. At this examination I knew nothing of the clinical history of the patient. On fluoroscopic examination of the stomach I found a p.otic, somewhat atonic stomach with a peculiar bourglass form. There was no evidence of ulcer or carcinoma. The duodenal bulb was normal. On careful examination of the region of the greater curvature I found a large oval calcified tumor mass in the left hypochondrium. This mass, about the size of a baseball, lay against the greater curvature of the stomach, pushing it toward the right and forward, producing a concavity in the outline of the greater curvature, with the resulting hourglass shaped stomach (Fig. 1). I could palpate the tumor with ease below the left costal margin and found that it moved somewhat with respiration. The lower pole was hard, rounded, and quite freely movable. I was able to distinguish a more dense periphery, forming what looked like a shell about the entire mass. Scattered throughout the entire mass could be seen darker linear and irregularly shaped intense shadows. The whole mass cast a very distinct shadow in contrast to its surroundings. Never having seen such a fluoroscopic picture, and knowing nothing of the clinical history of the patient, my first thought was that I

was dealing here with a calcified tuberculous kidney which was displaced downward on account of its increased weight. We made one X ray photograph of the abdomen with the woman lying on her back (Fig. 1). This shows what I have already described as evident at the fluoroscopic examination.

Examination of the chest revealed dense shadows in both apices more in the right than the left. There were also many striped and irregular shadows in both upper lobes. The heart and also the trachea were both displaced to the right. There was also an interlobar linear shadow between the right upper and middle lobes. The right diaphragm stood high and presented several adhesions with obliteration of the right phrenocostal angle. The diagnosis of the chest condition was tuberculosis of both apices with fibrous pleuritis on the right side and fixation of the right diaphragm.

The patient was advised to enter the hospital for examination but on account of the illness of a member of the family she could not do so. She left for her home in Hohenau near Vienna. From September 4, 1923, when the X ray examination was made until April 10, 1924, we did not see the patient.

On April 10, 1924, she came to the Wenckebach clinic because of loss of weight, weakness and hematuria which had lasted for 6 weeks. The diagnosis of calcified hypernephroma with hematuria was then made.

Examination. The patient is a woman of medium size with very little subcutaneous fat. There is no edema of the skin, no abnormal pigmentation. The mouth mucosa is normal. Temperature is 37 degrees C and respiration 20 per minute. The patient weighs 45 kilos.

The radial arteries are somewhat rigid. The blood pressure is 105 Riva Rocci. The pulse rate is 84 and regular. The pupils are equal in size and react normally to light and accommodation. The eye movements are normal. The tongue is moist and shows a fine tremor; it is not coated. The pharynx is normal. The thyroid is not enlarged. There are no enlarged glands in the neck, axilla or inguinal regions. Percussion reveals dullness of both apices of the lung, the right more than the left. Moist rales are heard over the right apex. The breath sounds are somewhat weaker over the right lung. Bronchial breathing is heard in the region of the left apex. Vocal fremitus is increased over the right lower lobe. There is dullness on the right side of the chest beginning at the level of the third rib in front and extending in a curved line to the eighth spine behind.

The apex beat is in the fifth intercostal space inside the mid clavicular line and only palpable when the patient lies on her left side. The heart is not enlarged. The heart sounds are normal.

The abdominal wall is relaxed. There is no ascites, no meteorism. Below the left costal margin a fist-sized tumor of very hard consistency is palpable. It can be distinctly felt over its anterior surface and lower pole and can be grasped by the fingers. It is separable from the spleen. The tumor is not painful.

There is marked dullness on percussion in the tumor area. The liver is not enlarged. The spleen is normal in size. Abdominal reflexes are normal.

April 11, 1924. Urine. Color reddish cloudy, reaction weakly acid. Albumin is positive. Sugar negative. Acetone and acetoacetic acid negative. Chlorides are not reduced. Positive blood reaction. Specific gravity 1.020 to 1.032. The sediment is rich in red blood cells and leucocytes.

April 12, 1924. Cystoscopy by Dr. Zinner. The urinary bladder is normal except for a slight chronic inflammation of the neck of the bladder. Both ureteral orifices appear normal. The right ureter yields an absolutely clear urine free from blood. Catheterization of the left ureter is made without any difficulty. No resistance is met and the catheter is passed 25 centimeters. Only a few cubic centimeters of bloody urine is obtained from the left kidney; then the catheter becomes obstructed by blood. Indigocarmine given intravenously gives a distinct green coloration of urine on the right side in 3-5 minutes, on the left side in 5 minutes.

Report of cystoscopy reads: Left sided hematuria with rather good kidney function.

April 16, 1924. Pyelography. Fifteen cubic centimeters of sodium bromide solution passes readily into the left kidney pelvis. The injection is controlled under the X ray screen. The fluid is visible as a compact mass in the lower medial circumference of the tumor. A photograph with the patient lying on the right side shows that on the inner circumference of the tumor, ventral and basal to it, is a large calyx filled with bromide solution. The rest of the pelvis is not visible, which speaks for projection of the tumor mass into the renal pelvis.

With postero-anterior fluoroscopy one sees that the renal pelvis is irregular and not sharply outlined in the lower and median portion of the calcified tumor and partly overlapping its borders. A lateral view shows the shadow to be made up of five distinct and separate bromide deposits which represent the filled portions of the deformed pelvis. Two of them lie on the anterior lower circumference of the tumor, one on the posterior circumference. The distance of these deposits from the tumor is only about 1 to 2 millimeters. Two other deposits lie about 1 centimeter below the lower pole of the tumor. The renal pelvis is therefore pushed downward by the tumor spread out flat in a plane almost at right angles to its normal long axis. The tumor itself is sharply outlined and oval in shape (Fig. 2).

The patient was operated upon in the Polyclinic Hospital (Prof. Rubritius) on April 18, 1924, by Assistant Dozent Dr. Schwarz to whom I am grateful for the following report of the operation.

A lumbar incision was made. After the fascia and musculature had been incised, the strongly vascularized rather thin fatty capsule of the kidney was visible. Through this the kidney and tumor could be seen. After the fatty capsule, which was adherent to the anterior surface of the kidney pelvis, had been opened, the lower pole of the tumor was freely mov-

able The ureter was ligated with double ligatures and cut As the kidney extended high up under the costal margin the twelfth rib was resected in order to free the upper pole Then the kidney was lifted out *in toto* The hilus region was prepared, the greatly dilated renal vein ligated, also the renal artery A mass ligature was then placed about the pedicle and the tumor and kidney removed The bleeding from the fat capsule was controlled, a drain placed in the wound and closed At 5 o'clock the pulse was 108 The handgazes were somewhat saturated with blood Spontaneous urination occurred that evening On April 23 the drain was removed On May 5 the patient left the Polyclinic Hospital for home

Examination of the tumor was made by Prof C Sternberg pathologist to the Polyclinic Hospital, and by myself

The kidney is of triangular form, with a length of 16 centimeters, width of 11 centimeters, and thickness of 9 centimeters It presents at both poles and on the side corresponding to the renal pelvis, a smooth reddish brown colored surface, whereas on the remainder of the surface it is nodular, and of a whitish yellow color with reddish stripes and spots scattered throughout (Fig 3) The capsule of the kidney is thickened and is especially difficult to remove in the last mentioned areas In the reddish brown areas the tissue is of a doughy soft consistency, whereas the rest of the mass is very hard The tumor cannot be cut with a knife because of the hardness due to calcification It is 10 centimeters long, 9 centimeters wide, and 10.5 centimeters in the antero posterior diameter It is cut into two halves with a saw On cut section the reddish brown areas are rests of kidney parenchyma in which the cortex and medulla are greatly thinned, with indistinct markings From this tissue the previously described whitish yellow tissue spreads out with unsharp outline over large portions of the cut surface of the tumor The whole tumor mass is elliptical in shape and surrounded by a thick capsule of connective tissue containing calcium deposits and in several places also bone tissue Penetrating into the tumor mass from the shell like capsule are numerous dense calcified or bony hard septa and lamellae These divide the tumor into numerous round or oval areas Some of these contain blood coagula and pigment Others contain white necrotic masses Near the periphery there are yellow areas of tumor tissue The renal pelvis is deformed, the mucosa thickened and hyperemic The kidney pelvis is compressed by the tumor mass so that it forms an irregular elongated narrowed cavity, which is pushed medianward and downward by the tumor mass (Fig 4) Histological examination reveals typical hypernephroma areas with areas of necrosis and hemorrhage In some of the lobules cystic degeneration has occurred In others blood pigment is present in considerable amount The capsule and some of the calcified septa contain in various places irregular masses of bone tissue The renal veins are entirely free from hypernephroma

On July 30, 1924, the patient returned to the Polyclinic complaining of pain in the back The urine was clear To the left of the spine and adherent to it a fist sized tumor mass could be felt in the abdomen There is a recurrence of the hypernephroma at the site of the tumor

On September 13, 1924 the patient again came to the Hospital complaining of severe pain on the right and also left side of the abdomen She had lost considerable weight and had very severe pain on walking She appeared subicteric In the left hypochondrium near the umbilicus was a dense fist sized tumor The right kidney lay low and was movable The patient left the hospital October 8, 1924

In a study of the literature I have not been able to find a case of calcified hypernephroma which was diagnosed by X-ray examination The hypernephroma described in the above case does not differ greatly in its pathological anatomy from a number of specimens described in the literature, nor from several which I have seen in the autopsy room The retrogressive changes in this case are characterized by marked calcification of the capsule of the tumor forming a hard shell The shell is from 1 to 4 millimeters thick, and in some areas has the consistency of bone tissue Parts of the capsule have remained uncalcified and consist of a dense hyaline connective tissue In the capsule and also in several septa of connective tissue within the tumor mass bone tissue was found The tumor is divided into many lobules of hypernephroma tissue in various stages of necrosis Some areas are distinctly yellow, others yellowish white, and in many places cystic degeneration can be seen, with hemorrhage and pigmentation (Fig 4)

These changes explain very well the X ray photographs of the tumor mass The X-ray pictures of the tumor taken before operation, and one of the tumor mass after extirpation of the kidney present the following findings

Surrounding the entire elliptical tumor shadow is a distinctly calcified shell varying in thickness from 1 to 4 millimeters This shell consists of linear and punctiform shadows, interrupted from place to place by areas of the capsule which contain little calcium Throughout the entire tumor mass are distinct and indistinct irregular small shadows of calcification, which assume a definite arrangement in many parts of the mass The shadows form

round or oval areas containing less distinct spots and small irregular calcium deposits. These give the tumor a lobulated appearance, forming a network of calcified masses separating small and large clearer spaces (Figs 1 and 2).

This X ray picture is characteristic of a tumor of the kidney of slow growth rich in connective tissue that is a tumor of the scirrhus type. Had the tumor been of the medullary type we would have found in the X ray photograph the thick calcified shell without the lobulated appearance throughout the tumor mass. The calcium deposits in the connective tissue of the tumor have produced superimposed shadows throughout the tumor mass but with a distinct lobular appearance due to a more marked thickening and calcification of some connective tissue septa than of others.

This picture differentiates itself at once from that of other diseases of the kidney which produce distinct X ray shadows and which I have described above. In the tuberculous kidney we never see so sharply outlined and spherical a mass the calcification is usually at the periphery and lacks the lobulated structure seen here. Furthermore the pyelogram (Fig. 2) in my case is characteristic of a tumor mass compressing dislocating and deforming the pelvis and calyces. Such a pyelogram rules out tuberculosis. A cyst of the kidney (echinococcus, etc.) with a smooth interior does not produce such a shadow, lacks the lobulated structure and has a capsule of more uniform thickness and density.

The X ray picture described is characteristic of a slowly growing hence calcified, kidney tumor with a lobulated structure and therefore of hypernephroma. Perhaps an adenoma of the kidney of so large a size could produce a similar picture or some other form of renal tumor. However, the characteristic X ray picture, the typical pyelogram, and the clinical findings enabled us to make a diagnosis of calcified hypernephroma in this case.

From a study of the pathology of hypernephroma I am inclined to believe that similar X ray pictures in hypernephroma will be found if these cases are photographed more often and that a roentgenologist who is

acquainted with this picture will be able to make a diagnosis of tumor of the kidney (most likely hypernephroma) from the photograph alone.

SUMMARY

Hypernephroma is a not uncommon tumor of the kidney found quite frequently on post mortem examination. Most hypernephromata probably originate as Grawitz believed from misplaced adrenal rests. Malignant hypernephroma rarely occurs in children. It may remain benign for years and then assume malignant characteristics. Cases are reported in the literature with a duration as long as 40 years.

Malignant hypernephroma is characterized by a special tendency to invade the renal vein and produce metastases in the osseous system and lungs. A solitary metastasis is no contra-indication to operation, for its removal together with the primary growth may result in cure or years of good health.

The slow growth of some hypernephromata is accompanied by marked degenerative changes with pseudo cyst formation, hemorrhages and pigmentation, hyaline changes, calcification, and even metaplasia to bone tissue. Some of the so called cysts of the kidney are degenerated hypernephromata.

Hæmaturia may be the first symptom of hypernephroma and may be present as long as 40 years. Every case of hæmaturia in a person past middle life should suggest the possibility of hypernephroma when no other cause for the hæmaturia can be found.

The X ray is of considerable value in the diagnosis of kidney tumor, and in its differentiation from other renal diseases which produce kidney shadows such as tuberculosis, cyst, etc.

A case of calcified and partly ossified hypernephroma of the left kidney producing gastric symptoms in a woman 46 years old is reported. It is of special interest because of its long duration (16 years) and the striking X ray findings. It was found on fluoroscopic examination of the stomach which presented an hourglass deformity. The X ray picture reveals a distinct calcified capsule and a definite lobulated structure characteristic of a slowly growing renal tumor of

the scirrhus type. A number of similar cases have been described in the literature, but this is the first case in which diagnosis was made by X ray during life. A knowledge of the X ray picture in this case will enable the roentgenologist and urologist to diagnose calcified hypernephroma in the future.

Removal of the calcified hypernephroma by nephrectomy was followed by a recurrence at the site of the tumor. The diagnosis of hypernephroma was confirmed by histological examination.

I wish to thank Dozent Dr. Karl Hitzenger, roentgenologist for the opportunity of studying this case.

LITERATURE

- ALBARRAN Ztschr f Roentgenkunde vi 41
 ALBRECHT P. Beitrage zur klin. und pathologischen Anatomie der malignen Hypernephrome Arch f klin Chir 1905 lxxvii 10, 3-11, 0
 ASSMANN H. Die klinische Roentgendagnostik der inneren Erkrankungen 3d ed 1924 p 741
 BACHRACH R., and HITZENBERGER K. Pyloradioskopische Studien. Verhandl d deutsch Gesellsch f Urol V Congress September 9 1921
 BAENSCH W. and BOEMINGHAUS H. Die Roentgendagnostik bei Erkrankungen des uropoetischen Systems Ztschr f urol Chir 1921 vii 48-101
 BAETJER T. The X ray diagnosis of renal calculi. Am Q Roentgenol 1906-1907 i 17
 BALL Kidney stones and tumors. Lancet 1914 Jan 31
 BARTHOU. Un cas de pseudo calcul. Congres de Clermont Terrand 1908
 BAUFER R. Hydronephrotische und stellenweise verkalkte Niere. Muenchen med Wchnschr 1913 lv 1413
 BRUNSTEN K. Beitrage zur klin. und pathologischen Anatomie der malignen Hypernephrome Ztschr f urol Chir 1918 ii 3
 BRAUSCH W F. Clinical data on malignant renal tumors. J Am M Ass 1913 lv 274
 BRIGNATELLI E. Tumore misto del rene con nodulo osteoblastomatoso. Folia urolog 1911 vi 34
 BURCHARD A. Die roentgenologische Nierendagnostik. Fortsch a d Geb d Roentgenstrahlen 1913 vi 244
 CASE I T. Calcified cyst of the kidney. Am J Roentgenol 1915 No 3
 DE WITT. Renal tuberculosis with calcification. J Radiol 1923 iv 400
 DIETLEN. Fortschritte in der roentgenologischen Nierendagnostik. Ztschr f Roentgenkunde 1911 xiii 85
 FISCHLBERG. Diagnose und Therapie der Nierentumoren. Ztschr f Urol 1908 ii 15
 FISLER F. Roentgenologische Fortschritte im Bereiche der Physiologie, Pathologie und Diagnostik der Harnorgane durch vorwiegende und systematische Anwendung des Durchleuchtungserfahrens. Fortsch a d Geb d Roentgenstrahlen 1922 xvix 1-20
 FLETCHER A. Contribution a l'etude des kystes hematiques du rein. Dissertation Paris 1905
 FABRICIUS J. Ueber partielle Nierenresektion eines cystisch epithelialen Tumors. Deutsche Ztschr f Chir 1911 cv 323
 FRANK O. Das maligne Hypernephrom im Kindesalter. Beitr z klin Chir 1910 lxxi 11
 FRANK K. and CLAS R. Ueber Hydronephrose. Ztschr f urol Chir 1922 ix 4
 LURVINS H D. Radiography of the kidney. Med Rec 1912 lxxvi 834
 GOLDBERG. Beitrag zur Roentgenologie und Pathologie der Nephrolithiasis. Muenchen med Wchnschr 1910 No 36 1915
 GRAESSNER. Zum Nachweis der Nierentuberkulose im Roentgenbilde. Ztschr f Roentgenk 1910 p 3, 6
 Verhandl d deutsch Roentg Gesellsch 1910 vi 4
 GROSGLIK. Roentgenogramm einer Krebsniere einen Stein simulierend. Monatsb f Urol 1906 vi 45, 452
 HITZENBERGER C. I. Roentgendagnostik des uropoetischen Systems. Fortsch a d Geb d Roentgenstrahlen 1909-1910 xiv 1-1
 Idem. Nierencyste im Roentgenogramm. Fortsch a d Geb d Roentgenstrahlen 1910 vi 300
 Idem. Die Roentgenuntersuchung des uropoetischen Systems in Groedel's Roentgendagnostik in der inneren Medizin 1923 ii 834-900
 HAUDEK. Verhandl d deutsch Roentg Gesellsch 1910 vi 6
 HEINICKE H. Ossifizierende Sarkommetastasen im Roentgenogramm. Fortsch a d Geb d Roentg 1909 13 231-36
 HOFMANN E. Verkalkte Nebenmerengeschwulst. Zentralbl f Chir 1923 lvi p 1262
 HUNKE and LUBARSH. Handbuch der speziellen Pathologie und Histologie (Kidney). J Springer 1923
 HITZENBERGER K. and REICH L. Die statische und respiratorische Verschieblichkeit der normalen Niere. Wien klin Wchnschr 1921 xxvii 345-346
 HOFFMANN H. Die Bedeutung der Roentgenstrahlen fuer die Urologie. Zentralbl f Roentgenstrahlen 1911 ii 1-11
 HOLLAND. The X ray diagnosis of renal calculus. Ztschr f Roentgenk 1911 p 8
 ILLIES J. Fibrose Pannipennis bei harnsaurer Diathese. Jolia urol 1912 vi 691
 ISRAEL W. Zur Pathologie der Hypernephrome. Verhandl d deutsch Gesellsch f Urol 1913 416. Demonstration zur Nierenchirurgie. Deutsche Ztschr f Urol 1913 vii 262
 JAGGECY L. Custombildung im Bereiche eines Renculus. Arch f path Anat 1906 clxxix 68
 JOSEPH E. Die chirurgischen Erkrankungen der Niere im Roentgenbilde. Ztschr f urol Chir 1912 v 251
 KRY C. and AXELUND A. Fall von verkalktem Aneurysma in der Arteria renalis. Fortsch a d Geb d Roentg 1917-18 xvi 551
 KNOX K. Radiography and Radio Therapeutics. 4th ed. vol 1 p 372-415
 KOEHLER J. International Congress of Medicine in London. Roentgen Section August 1913
 KOLL F. Zum Roentgennachweis paranephritischer Abszesse. Fortsch a d Geb d Roentgenstrahlen 1913 vi 298-303
 KRAFT F. Fortsch a d Geb d Roentgenstrahlen 1913-1914 xvi 193 (Report of Roentgen Congress in Palermo)
 Idem. Selbstheilung bei Hypernephrom. Ztschr f urol Chir 1920 v 16-26
 KROENKLEIN and WISS. Cited by J Fabricius
 KULSTER F. Die Neubildungen der Niere und ihre Behandlung. Zentralbl f d Krankheiten d Harn u Sexualorgane 189, viii 583-93
 Idem. Die Nierenchirurgie im 19 Jahrhundert. Arch f klin Chir 1901 lxxv 359-58

- Idem Diagnostik und Therapie der Nierentumoren Ztschr f Urol 1908 II 1-14
- LEOPOLD G Mannskopfgrosse Blutcyste der linken Niere Arch f Gynaek 188 xiv 129
- LEVY DORN Verhandl d deutsch Roentg Gesellsch 1910 VI 76
- LICHTENBERG A VON and DIETLEN H Die Nierentuberkulose im Roentgenbilde Mitt a d Grenzgeb d Med u Chir 1911 XIII 739-754
- LIEBMAN M Zur Diagnostik der malignen Nierentumoren Ztschr f Urol 1922 xvi 347-364
- LOMON M Two radiograms of kidney tumors Bull et mém Soc de radiol de Par 1913 June
- LOTSY Beitrag zur Roentgenologischen Diagnostik der Bilharziosis des Nierenbeckens und des oberen Ureters Fortschr a d Geb d Roentgenstrahlen 1922 xvi 210
- LUGER A Zur Kenntnis der radiologischen Befunde am Dickdarm bei Tumoren der Nierengegend Wien klin Wchnschr 1913 xvi 263-265
- MARION G Une nouvelle cause d'erreur dans la radiographie des calculs du rein J d urol 1912 I 655-658
- NEUBAUER H Ueber einige Erfahrungen aus dem Gebiete der Nierensteinerkrankungen Italia urol 1909 IV 351-372
- NOESSELE Scheinbare Nephrolithiasis Fortschr a d Geb d Roentgenstrahlen 1911 xvi 332
- OEHLCKER F Kittniere und Kittureter im Roentgenbilde Ztschr f urol Chir 1922 x 47-51
- Idem Zur Klinik der malignen Tumoren der Nebenniere Ztschr f urol Chir 1913 I 44-74
- Idem Uebersichtsaufnahmen vom uropoetischen Systeme Fortschr a d Geb d Roentgenstrahlen 1911 xvii 195-207
- PERUSSIA Cited by F Kraft
- PLESCHNER H G Beitrage zur Klinik und pathologischen Anatomie der malignen Hypernephrome Ztschr f urol Chir 1913 I 309-374
- REVÉSZ V Fuer Echinococcus gehaltene Nierensteine Fortschr a d Geb d Roentgenstrahlen 1921-22 xviii 440
- REYNARD Kidney tumor with bilateral nephrolithiasis Lyon méd 1914 February 4 Lyon méd 1914 April 5
- ROLLESTON H D and BOVET E Addison's disease and calcification of the adrenals Proc Roy Soc Med 1914 4
- RUBASCHOW S Die Roentgenologie im Dienste der urologischen Chirurgie Ztschr f urol Chir 1913 I 465-524
- SCHIELE K Beitrage zur Klinik der Nierengeschwulste Ztschr f urol Chir 1922 x 283-294
- SCHITTENHELM A Lehrbuch der Roentgendiagnostik 1924 II 137
- SCHWARZWALD R T Die Bedeutung der Pyelographie fuer die Diagnose der Nierentumoren Wien med Wchnschr 1921 lxxi 1, 22 and 1810
- SCALITZER M Zur Roentgendiagnostik der Nierenkonkremente Arch f klin Chir 1921 cxvi 231-259
- SMART M The X-ray diagnosis of renal calculus Brit M J 1905 II 617
- SOEDERLUND G Zur Frage der Roentgendiagnostik der Nierentuberkulose speziell der sog Kittniere Italia Urol 1913 vii 75-94
- SOREL R Kyste hydatique du rein Arch prov de chir 1906 xv 371-375
- STOERK O Zur Histogenese der Grawitzschen Nierengeschwulste Beitr z path Anat u allg Path 1908 xlii 393-437
- STRAUSS Verhandl d deutsch Gesellsch f Urol 1909
- STRAETER Nierenuntersuchungen mittelst Roentgenstrahlen Ztschr f Roentgenkunde 1908 x 41
- Idem Die Roentgenographie der Nieren Verhandl d deutsch Roentg Gesellsch III 90
- THIERRY H Beitrage zur Symptomatologie und Therapie der Hypernephrome Muenchen med Wchnschr 1921 lxxvi 638-640
- WEIL R Concerning a distinct type of hypernephroma of the kidney which simulates various cystic conditions of that organ Ann Surg 1907 lxxvi, 418
- WOLFF A Die geschlossene kavernoese Nierentuberkulose Ztschr f urol Chir 1921 vi 374-375
- WOLFF Beitrag zur Chirurgie der tuberkulosen und Steinnieren Berl klin Wchnchr 1908 No 5

IODIZED OIL AS A PYELOGRAPHIC MEDIUM¹

WITH A REPORT OF 27 CASES

By C H NEUSWANGER, M D, WATERBURY, CONNECTICUT
From the Department of Surgery Yale University School of Medicine

THE results of an experimental study of the use of iodized oil as a pyelographic medium have been given in a preliminary report (4). The purpose of this paper is to present further experimental data together with the results of its use in the clinic in 27 cases. The solution used in the previous experimental work consisted of a 40 per cent iodized oil.² The solution employed in the clinic, consisted of an emulsion of 90 parts of the 40 per cent iodized oil, with 10 parts of a neutral soap solution. The soap solution was added because it was found that the original solution flowed with some difficulty through small ureteral catheters. The slight decrease in the opacity of the emulsion was found to be negligible.

In the year 1897, Winternitz (7) described a method of preparing iodized oil using an animal fat. He (8) fed this solution to certain animals and found that the iodine was absorbed from the gastro intestinal tract. Since that time iodized oil has been used for the therapeutic effect of the iodine and has been given to both experimental animals and human subjects with no untoward results. Iodized oil at the present time is available under the commercial names of liodol, iodolene, and iodipin 40 per cent.

The first preparation is a French product of carnation oil in chemical combination with iodine to the amount of 0.54 gram per cubic centimeter. The second is a very similar French product of poppy seed oil with approximately 30 per cent of iodine. The third is a German product of sesame oil in chemical combination with iodine to the amount of 0.51 gram per cubic centimeter.

Although the combination of iodine with the various unsaturated fats used in the above products is organic and the resulting

product quite inert the decomposition products might prove irritating and toxic. It is, therefore, advisable not to heat the above preparations for sterilization or to expose them to light for long periods.

Forestier and Sicard (1) in 1922 first demonstrated the value of iodized oil as a contrast medium in roentgenography. Iodized oil has been used by these authors (2) as well as by many other European workers (6) for intra tracheal injections and for the localization of spinal cord lesions. Russell (5) has likewise reported its use in an American clinic. It has been generally reported that the solution is relatively impervious to the roentgen rays and only slight reactions have been observed. It has been found that the solution when injected into the spinal canal remains for many months before absorption takes place and causes very little if any reaction.

EXPERIMENTAL STUDY

Before we used this opaque medium in the clinic it seemed advisable to answer the following questions by animal experimentation:

1 Does the iodized oil give an appreciably better shadow than a sodium iodide solution in pyelography?

Taking a 12.5 per cent solution of sodium iodide, which is the concentration generally employed, a comparison of the opacity of this solution with that of 40 per cent iodized oil is obtained by comparing the iodine concentration since it is upon this that the opacity depends. The ratio of the iodine content of the sodium iodide and the emulsified iodized oil is approximately 1 to 3.

An actual comparison was presented in a preliminary report (4) of cases in which equal amounts of both solutions were injected for pyelograms under similar conditions. A study of this comparison leaves little doubt as to the desirability of a more opaque medium than that of 12.5 per cent sodium iodide.

¹Abridgment of thesis submitted to the Faculty of the Graduate School of Yale University in partial fulfillment of the requirements for the degree of Master of Science in Surgery May 1925.

²Iodipin 40 per cent (Merck).

¹Presented before the Clinical Congress of the American College of Surgeons New England Section March 27 1925.

Figure 1 is the film of a bilateral pyelogram in which iodized oil was used in a dog in which an experimental ureteral infection¹ had been produced and resulted in a right pyonephrosis hydro ureter and multiple ureteral strictures. The left ureteral shadow which represents less than 2 cubic centimeters of iodized oil is plainly outlined upon the vertebrae.

2 Has iodized oil any irritative action upon the urinary tract?

A series of 18 pyelograms 8 of which were bilateral were made upon healthy dogs iodized oil being used. The animals were followed for periods varying from 10 days to 4 months and in each case there were no symptoms observed which were attributable to toxicity or irritation of the urinary tract. One animal known to have complete destruction of the right kidney likewise showed no untoward symptoms following bilateral pyelography (Fig 1).

3 If the iodized oil was accidentally forced into the circulation by the pyelovenous route (3) what would be the effect?

The following experiments were done to determine the results of such an accident. For these experiments 6 normal dogs were chosen. Dogs 1 and 2 received 10 cubic centimeters of 40 per cent iodized oil intravenously, 3 and 4 each received 12 cubic centimeters and 5 and 6 each received 14 cubic centimeters. Roentgen ray plates of the abdomen and chest were taken 5 and 10 minutes and 24 hours following the injection and no evidence of the oil was seen upon the roentgen ray films. Animal 1 was killed 48 hours following the injection. Grossly the lungs showed multiple hemorrhagic areas throughout bright red in color and varying in size from 2 millimeters to 2 centimeters. Microscopic examination of these areas showed groups of collapsed alveoli engorgement of the capillary vessels and infiltration of the alveoli with red cells and mononuclear and polymorphonuclear leucocytes. After staining with Heimer's fat stain sections from the lungs, the liver, the spleen, and the kidneys diffuse multiple microscopic globules of oil were seen

throughout the tissues. Animal 3 was killed on the tenth day following injection. Examination of the lungs showed multiple hemorrhagic areas throughout very similar to those in animal 1 aside from a darker color of the lesion. These lesions were slightly elevated firm in consistence and a dull brown in color. The microscopic examination of these areas showed collapsed alveoli engorgement of the capillary vessels with an infiltration of red cells and numerous mononuclear and polymorphonuclear leucocytes. Animal 5 was killed on the twenty eighth day following injection and postmortem examination of the lungs showed frequent areas throughout of a dull red brown color moderately firm in consistence and slightly elevated. Microscopic examination of these areas showed some infiltration with mononuclear and polymorphonuclear leucocytes and a large amount of fibrous tissue.

Animals 2, 4, and 6 were kept under observation for a period of months without showing any unusual symptoms and appearing in normal condition at the end of this period. None of the animals used in these 6 experiments showed any respiratory distress, evidence of pain or other symptoms which were attributable to the intravenous injection. In each of the above experiments the animals received approximately three times the amount of iodized oil intravenously which would normally be required to make a pyelogram and ureterogram in the dog. A study of the various stages in the above experiments would indicate that a temporary embolic obstruction of the small pulmonary vessels had taken place and that resolution had followed with no serious results to the animals.

4 Has iodized oil any bactericidal or bacteriostatic action?

Agar plates upon which iodized oil was smeared were inoculated with bacillus coli, staphylococcus aureus, and streptococcus hemolyticus. Upon examining these plates it was found that the organisms were growing in close proximity to the globules of oil and no inhibitory action was observed. Quantities of the iodized oil exposed to the air for several months showed no evidence of

decomposition and no colonies of bacteria or fungi were observed

CLINICAL STUDY

Iodized oil was used as a pyelographic medium in 27 patients with various urinary conditions as shown in Table I

TABLE I URINARY CONDITIONS IN 27 PATIENTS

Normal kidney and ureter	5
Double kidney	1
Horseshoe kidney	1
Renal ptosis	1
Hydronephrosis	3
Ureteral stricture	4
Hypernephroma	1
Renal calculus	3
Ureteral kink	1
Renal infarct	1
Pyelitis	1
Malignant papilloma of renal pelvis	1

Satisfactory shadows of the iodized oil injections were obtained in every case and in 2 instances when previous pyelograms and ureterograms with a 12.5 per cent solution of sodium iodide solution had failed to cast a shadow sufficient to make a diagnosis

Iodized oil was found to be especially useful in obese patients and even a small injection of 0.5 cubic centimeter into the ureter gave a dense shadow. As may be observed in the reproductions of the films the ureteral shadow is plainly outlined even when superimposed upon the large pelvic bones. Ureteral injections were found to be more complete with iodized oil than sodium iodide solution, probably due to the relative weight of the 2 solutions and the increased viscosity of the iodized oil. That the oil readily escapes from the renal pelvis and ureter was shown in many instances where the oil was removed immediately following the injection. On several occasions repeated roentgen ray plates of the abdomen 12 hours after the injection showed no trace of the medium.

In this series of 27 cases, 15 patients were allowed to leave the hospital following the examination and 12 were followed in the hospital wards. In no instance were any symptoms detected which could be attributed to irritation from the iodized oil and it was quite evident that these patients were free from many of the distressing symptoms fre-



Fig 1 Bilateral pyelogram of live dog after iodized oil injections 12 cubic centimeters in right and 5 cubic centimeters in left showing a hydronephrosis with multiple ureteral strictures and dilated ureter of right side

quently observed following the use of a sodium iodide solution. Following the injection of iodized oil into the ureter a relief of the symptoms of irritation was often observed as has been frequently observed to follow the injection of olive oil into the ureter in cases with ureteral calculi. A filling defect of the renal pelvis resembling a pathological condition may result from the injection of an insufficient amount of the iodized oil. This was overcome to a certain extent by the use of an emulsion of the iodized oil as described above. The ureteral injections were always made more readily than those of the renal pelvis and iodized oil was found to be particularly useful in ureterography.

CASE I. J. M., male married, aged 54 occupation watchman entered the New Haven Hospital February 26, 1925. For the past 2 years the patient has had attacks of sharp pain in the left flank, intermittent in character and usually occurring at night. One year before admission the patient fell upon a rock striking his left side. Following this the attacks have become more severe and have been associated with weakness. Six weeks before admission the patient gave up his work and was completely incapacitated on account of the pain. At this time the patient first noticed that his urine was cloudy and contained blood. He also began having nocturia frequently and burning on urination. The pain became continuous and he was unable to lie on his left side. The personal history is irrelevant.



Fig 2 Pyelogram and ureterogram in patient with malignant papilloma of left renal pelvis and ureter. Anatomical specimen shown in Figure 3

Physical examination Aside from a large non tender mass in the left upper abdomen and slight pallor the examination was essentially negative

Clinical diagnosis hydronephro is left

Cystoscopic examination showed a small papilloma atous growth about 5 centimeters in diameter protruding from the left ureteral orifice. The growth was villous in character but the pedicle could not be entirely seen. The left ureter was catheterized with some difficulty and there was no flow of urine from the catheter. Fifteen cubic centimeters of 12.5 per cent sodium iodide were injected through the catheter but no shadow was obtained the fluid evidently escaping into the bladder.

Repeated cystoscopic examination A No 7 French catheter was passed with some difficulty into the left ureter and 10 cubic centimeters of dark bloody fluid escaped. Sixteen cubic centimeters of iodized oil were injected for the pyelogram (Fig 2).

Diagnosis papilloma of the left renal pelvis with transplant in the bladder.

Anatomical diagnosis malignant papilloma of the left renal pelvis (Fig 3).

CASE 2 A L female married aged 23 occupation housewife. Previous admissions to the New



Fig 3 Drawing of the cut surface of the pathological specimen in Case 1 showing the renal pelvis and upper ureter filled with tumor. All but one of the calyces were filled with an adherent blood clot.

Haven Hospital (1) July 13 1921 spontaneous delivery (2) March 13 1922 cystitis and pyelitis (3) October 5 1923 mercurial poisoning and (4) December 12 1923 gonorrhoeal endocervicitis.

February 21 1925 patient entered hospital. For 8 days previous to admission the patient had attacks of dull aching pain over the right hip. The pain at times was quite sharp in character but not associated with fever or vomiting. The pain frequently radiated down into the inguinal region. Since onset the patient has had nocturia frequency, and burning on urination with no history of haematuria or passage of calculi. She had lost 12 pounds in weight in the past 4 months. Patient had pyelitis and cystitis in 1922 with the usual symptoms other wise the history was irrelevant.

Physical examination The patient was pale and fairly well nourished. There was definite tenderness in the right upper quadrant with right costovertbral tenderness. No masses were palpable aside from the right kidney which was readily outlined. The physical examination was otherwise essentially negative.

Cystoscopic examination showed the bladder mucosa dull in appearance, the bladder urine showed occasional pus cells and many colon bacilli. Both ureters were catheterized without difficulty and both urine specimens were negative upon examination. Eleven cubic centimeters of iodized oil were injected for a pyelogram and ureterogram of the right side.

Diagnosis from cystoscopic examination right hydro ureter with stricture. Chronic cystitis.

Examination of the roentgen ray film (Fig. 4) showed a dilatation of the right ureter down to a point opposite the transverse process of the fourth lumbar vertebra. At this point there was a marked stricture of the ureter for a distance of 1.5 centimeters below which the ureter was somewhat larger than normal.

The patient returned for two ureteral dilatations. The patient was seen 2 months following the last treatment but refused further treatment because her symptoms had entirely subsided.

CASE 3 F. H., aged 32, occupation housewife, was admitted to the New Haven Hospital April 24, 1925. Three weeks before admission the patient developed a constant dull aching pain in the right flank. The pain gradually grew more severe and was aggravated by the patient's menstrual flow and by an attack of influenza. The patient had noticed a mass in the right flank following the onset of the present illness. She had marked burning and frequency of urination but no other urinary symptoms. She at times felt chilly and nauseated, but did not vomit.

Physical examination. There was a moderately large tender mass in the right flank, palpable by manually and approximately the size of a grape fruit. The liver could be palpated separate from the mass. The examination was otherwise essentially negative.

Clinical diagnosis right hydronephrosis.

Cystoscopic examination was made and the right ureteral catheter ascended to a distance of about 4 centimeters where an obstruction was encountered. Both ureteral specimens of urine were negative. The bladder urine showed numerous bacilli and an occasional pus cell. Thirteen cubic centimeters of 12.5 per cent sodium iodide were injected into the right catheter. The resulting roentgen ray film showed a dilated right renal pelvis but the ureter was not well outlined.

Diagnosis from cystoscopic examination right hydronephrosis, right hydro ureter with stricture and chronic cystitis.

Repeated cystoscopic examination was made and bougies Nos. 5 to 9 French were passed with some difficulty into the right ureter, an obstruction being met at approximately 5 centimeters from the ureteral orifice. A No. 6 French catheter was then introduced into the right ureter well beyond the stricture. After the injection of 4 cubic centimeters of iodized oil the patient began to complain of discomfort and the ureterogram was taken at this point.



Fig. 4. Case 2. Ureterogram of patient after injection of iodized oil, showing a stricture of the lower ureter with dilated ureter above the strictured area.

An examination of the film (Fig. 5) shows a stricture about 3 centimeters in length extending over the pelvic brim. The catheter appears within the stricture area as it was left in place. This patient received 3 ureteral dilatations at intervals of 10 days. The patient's symptoms were entirely relieved by these treatments and when she was seen 3 months following the last treatment had had no pain.

CASE 4 P. K., aged 54, occupation, motorman on admission to the New Haven Hospital complained that he had had pain in the back for the past 10 days having been compelled to stop work 4 days before admission. The lumbar pain dated back for a period of 10 years with a history of frequency of urination and nocturia for that period.

Physical examination was essentially negative.

Cystoscopic examination. A No. 5 French catheter ascended for a few centimeters up the left ureter where a very firm resistance was encountered. A No. 4 French bougie passed to the left renal pelvis with only slight resistance. A No. 7 French bougie would not pass the place of resistance met by the No. 5 catheter. A No. 6 French catheter was inserted as far as the point of obstruction and 6.5 cubic centimeters of iodized oil were then injected for a ureterogram with the result shown in Figure 6.

The patient received three ureteral dilatations following which he was almost entirely relieved of his symptoms.

CASE 5 A. M. aged 50, occupation factory worker. Five days before admission to the New



Fig 5 Case 3 Structure of the ureter extending over the pelvic brim The ureteral injection of 4 cubic centimeters of iodized oil was made with the catheter in place

Haven Hospital the patient was seized with a sharp pain in the left flank and back which radiated to the bladder region. The pain was severe in character and completely incapacitated the patient. Soon after the onset of the pain the patient took a dose of castor oil which he immediately vomited. The patient had a second and very similar attack of pain 12 hours after the first which was followed by vomiting and burning on urination. Otherwise the history was essentially irrelevant.

Physical examination. There was slight tenderness on pressure over the left kidney; otherwise the examination was essentially negative.

Cystoscopic examination was made and showed a small bright red blood clot protruding from the left ureteral orifice. A catheter was passed into the left ureter but met an obstruction at approximately 10 centimeters from the ureteral orifice. Several attempts were made to overcome the obstruction without success. An intravenous injection of phenolphthalein gave no excretion from the left ureter in 30 minutes. The urine specimen showed many red blood cells and a few pus cells but no organisms. Only a few cubic centimeters of 12.5 per cent sodium iodide solution could be injected into the left ureter. The resulting roentgen ray film showed a faint irregular shadow in the left renal pelvis and ureter.

Repeated cystoscopic examination. A Garceau catheter was passed into the left ureter. About 14 cubic centimeters of dark bloody fluid escaped from the catheter. Following this 15 cubic centimeters of iodized oil were injected for the pyelogram and ureterogram. The resulting film (Fig 7) shows a dilatation of the upper calyces and the lower calyces and the upper portion of the ureter are very



Fig 6 Case 4 Ureterogram showing a very narrow structure a few centimeters from the bladder. It was impossible to pass the catheter beyond the point of structure. Six and one half cubic centimeters of iodized oil were used.

irregular in shape. There is also a well defined right ureteral kink.

Operation. A left nephrectomy was done and the patient made an uneventful recovery from the operation.

Anatomical diagnosis. Infarct of kidney, nephrolithiasis, chronic pyelitis and ureteral stricture, left.

An examination of the anatomical specimen (Fig 8) showed the upper portion of the kidney to consist of collapsed cysts containing numerous calculi. The kidney parenchyma was replaced by an overgrowth of fibrous tissue with hyalinized glomeruli. The blood vessels were thickened and sclerotic. There was a stricture of the ureter 4 centimeters from the pelvis.

SUMMARY

A solution of iodized oil containing approximately 40 per cent iodine in chemical combination with a vegetable oil has been found by many investigators to be almost entirely free from toxic properties when used for



Fig 7 Case 5. Pyelogram and ureterogram after injection of 15 cubic centimeters of iodized oil showing ureteral kink multiple ureteral strictures and defects of the renal pelvis due to degeneration of the kidney. Pathological specimen shown in Figure 8

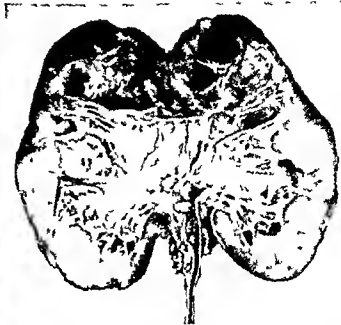


Fig 8 Photograph of pathological specimen Case 5 showing degeneration with renal calculi and multiple ureteral strictures following an infarct of the kidney

intratracheal and intrathecal injections. It has been found to persist in the body cavities following injection for many months, being gradually absorbed without causing symptoms of irritation.

The iodized oil was used upon a series of laboratory animals as a pyelographic medium giving excellent results and producing no evidence of toxicity or irritation of the urinary tract.

When injected into the venous circulation in dogs in large amounts, it was found to cause areas of temporary congestion with hemorrhage and infiltration of the alveoli of the lungs, but animals observed for a period of 2 months showed no untoward symptoms.

The iodized oil was found to possess no appreciable bactericidal or bacteriostatic action.

In the clinic, very satisfactory ureterographic and pyelographic shadows were ob-

tained when an emulsion of iodized oil was used. This was true in 2 cases when previous pyelograms and ureterograms made after the injection of 12.5 per cent sodium iodide failed to cast a shadow sufficient to make a diagnosis.

Iodized oil was found to be especially useful in obese patients and even a small injection of 1 to 2 cubic centimeters into the ureter gave a very dense shadow. Ureteral injections were found to be more complete with iodized oil than sodium iodide in several instances in which a direct comparison was made.

The oil was found to escape readily from the urinary tract and roentgen ray examinations 12 hours following the injection gave no evidence of residual oil within the renal pelvis or ureter.

Iodized oil was used upon a small series of patients with good results. Some of the patients examined had had marked destruction of renal tissue, but the iodized oil injections were borne without symptoms of irritation or evidence of any harmful effects upon the diseased kidney.

CONCLUSIONS

1. Iodized oil 40 per cent has no marked bactericidal or bacteriostatic properties.

2 Iodized oil 40 per cent injected intra-venously in dogs in quantities 3 times that used for the average pyelogram and ureterogram may produce areas of congestion and hæmorrhage in the lungs without any permanent anatomical change the animals showing no symptoms of irritation or toxicity over a period of 2 months

3 Iodized oil 40 per cent may be used to inject the urinary tract in laboratory animals and patients without resulting symptoms of irritation or toxicity

4 This preparation appears to offer a pyelographic medium which is superior to

those in use at the present time in regard to toxicity and degree of opacity to the roentgen ray

BIBLIOGRAPHY

- 1 FORESTIER J and SICARD J A. Bull et mém Soc méd d hôp de Par 1922 xlv1 463
- 2 FORESTIER J and LEROUX L. Ibid 1923 xlv1 299
- 3 HICMAN F and LEE BROWN R K. J Am M Ass 1924 lxxxi 607
- 4 NIUSWANGER C H. J Am M Ass 1925 lxxiv 1816
- 5 RUSSELL F C. J Am M Ass 1924 lxxxi 1775
- 6 SICARD J A and FORESTIER J. Rev neurol 1922 xxviii 1264
- 7 WINTERSTADT H. Deutsche med Wchnschr 1897 xxiii therap Beil 33
- 9 Ibid 1897 xxiii 477

STREPTOCOCCUS IMMUNIZATION OF RABBITS IN PREVENTION OF STREPTOCOCCUS ARTHRITIS

PRELIMINARY REPORT

By LAWRENCE H MAYERS M A M D and MITAL SCHROEDER Ph D CHICAGO

NUMEROUS attempts have been made to offer satisfactory theories concerning the cause of arthritis but a careful review of the literature tends to show that bone and joint inflammations are very commonly caused by a bacterial infection. It is a well known fact that an inflammation of the joints often follows and sometimes precedes an acute general infection or accompanies chronic foci of infection. Upon removal of these foci the arthritis may disappear at once or it may become active for a period and then disappear. Attacks of acute arthritis like all bacterial diseases are accompanied by a rise of temperature and by a leucocytosis. The secondary symptoms of this disease such as metabolic disorders and menstrual disturbances, which often complicate its clinical picture can all be explained upon the basis of bacterial infection. Furthermore autopsy and biopsy procedures on arthritics have definitely demonstrated the presence of bacteria in the lesions. That these bacteria may be the primary cause of arthritis has been proved by animal experimenta-

tion. Laboratory animals injected in a proper manner with certain bacteria will develop arthritis in practically all the different ways in which it is manifested in the human. As in the human the infection is more likely to attack those joints which are more weight bearing or are more subject to accidental traumatization. This is practically the extent of our knowledge of the subject of etiology. We are not at all sure how many different kinds of bacteria are capable of causing arthritis under precisely what conditions they cause it or whether certain bacteria always cause a certain type.

Specialists in the various branches of medical science have classified the different types of arthritis on the basis of evidence with which they happened to be familiar. The bacteriologist for example has classified this disease according to the causative organisms, the pathologist according to the lesions found, and the clinician according to the clinical findings which he, of course, interprets from the standpoint of his particular specialty. These classifications however have been of

little value to the general practitioner and indeed, it does not seem possible on the basis of our present knowledge to devise a classification which will take adequate account of the multiform and often seemingly contradictory evidence that has been accumulated.

Methods of treatment likewise have taken many forms. Chemical and physical means are but palliatives, correction of metabolic disturbances merely increases resistance to continued infection, immobilization of joints with the idea of preventing irritations by means of casts interferes with the normal circulation of the bone while the immobilization by means of surgery is often the direct cause of a polyarthritis. The removal of accessible foci may sometimes effect a cure but it is evident that such methods are useless in case of inaccessible foci in vital organs or more generalized infections. Vaccine or serotherapy, which theoretically ought to be the best means of curing arthritis assuming the disease to be of infectious origin has thus far not proved generally successful although striking results have unquestionably been obtained in isolated instances.¹

In view of the fact that the bacterial field seems to be the most logical as well as the most promising one for investigations on arthritis at the present time we have selected this field for special experimentation and are here presenting a preliminary report of the results of our work.

The organisms used in this experiment were two strains of streptococcus viridans both isolated from the blood of patients having an endocarditis and one strain of streptococcus haemolyticus isolated from pus of a knee abscess. These organisms when injected into rabbits produce joint changes causing lameness, tenderness and at times, swelling of the infected parts. At autopsy, these rabbits may show either a purulent or non purulent synovitis, chondritis or tenositis, or an osteitis and bone erosion. The photograph (Fig 1) shows a normal hip joint of a rabbit *a* and two views of a non purulent arthritic joint,

The work of Dr. Reginald Burbank may here be noted. Dr. Burbank's method of treating arthritis with autogenous vaccines is the most extensive vaccine treatment that has yet been instituted and seems to be proving successful. This vaccine is now being tried clinically by one of us.

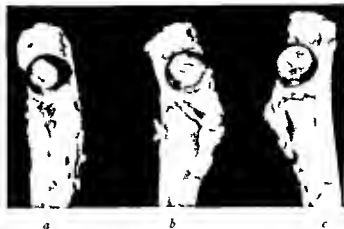


Fig 1 Photographs of *a* normal hip joint and two views *b* and *c* of a non purulent arthritic joint which show an erosion and slight extension of the infection into the bone.

b and *c* which show an erosion and a slight extension of the infection into the bone.

Evidence of bone and joint changes in rabbits injected with these organisms is also given by the X-rays taken of living animals which showed lameness and tenderness of joints.

The X-rays Figures 2 and 4 of the lower forearm including the carpal and metacarpal bones in anteroposterior and lateral views show very marked tumefaction of the soft structure about the carpus with malposition of the metacarpal bones. There is a definite area of haziness in and about the joint space characteristic of the density of purulent fluids. There is definite evidence of partial destruction and erosion of the ends of the radius and ulna and also of the carpal bones. The shadows follow the tendon sheaths well down along the metacarpal and phalangeal bones. Figures 3 and 5 show the same views of a normal lower forearm in which the bones appear in their usual position and density. The epiphyses are those of young well developed animals.

The anteroposterior and lateral views of the ankle joint in Figures 6 and 8 show marked tumefaction in and about the joint and the haziness is that most commonly seen of purulent fluids. In the anteroposterior view there is evidence of destruction of the tarsal bones with irregularity of the joint surface and extension along the tendon sheath. Figures 7 and 9 show the corresponding views of a normal joint.



Fig 2 Anteroposterior roentgenogram of lower forearm with carpal and metacarpal bones showing marked tumefaction of the soft structure about carpus and malposition of the metacarpal bones

Fig 3 Anteroposterior roentgenogram of normal lower forearm. The bones appear in their usual position and density

The knee joint in Figure 10 shows marked involvement in and about the joint with evidence of a destructive process involving the articular surfaces of the joint but apparently the destruction is most marked in the cartilaginous structure. A normal knee joint in similar position is shown in Figure 11



Fig 4 Lateral roentgenogram of same foot as shown in Figure 2

Fig 5 Lateral roentgenogram of same foot as shown in Figure 3

The object of our experiment was to test the protective value of a specific streptococcus extract prepared according to the rapid freezing and thawing method devised by Dr C O Melick.¹ The method of procedure was as follows: the 48 hour broth cultures (total 300 cubic centimeters) of the streptococcus strains mentioned above, were centrifugalized and

Melick C O J M d Research 19: 21: 37

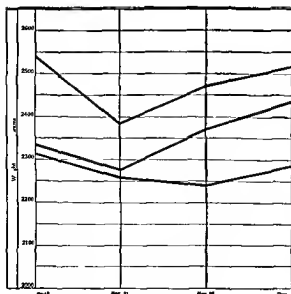


Chart 1 Weights of control rabbits

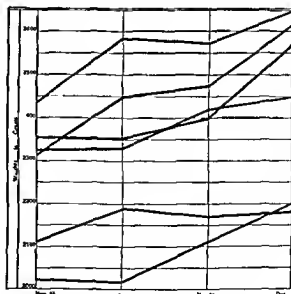


Chart 2 Weights of immunized rabbits



Fig 6 Anteroposterior roentgenogram showing marked tumefaction in and about joint and haziness most commonly seen in the presence of purulent fluids

Fig 7 Lateral roentgenogram of same foot as shown in Figure 6

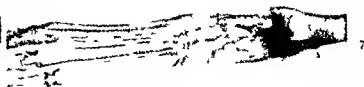


Fig 8 Anteroposterior roentgenogram showing marked tumefaction in and about joint and haziness most commonly seen in the presence of purulent fluid

Fig 9 Lateral roentgenogram of same foot as shown in Figure 8



the supernatant broth removed. The sediment was suspended in sterile physiological salt solution, again centrifugalized and the supernatant fluid drawn off. This process of "washing" was repeated three times to remove as much of the culture medium as possible. Finally, the sediment of organisms was suspended in exactly 20 cubic centimeters of sterile physiological salt solution. This suspension of organisms was subjected to 23 rapidly repeated processes of freezing and thawing and was then passed through a Mandler filter. The filtrate was collected in sterile vaccine bottles and when tested culturally for viable organisms was found to be absolutely sterile. Its toxicity was tested by injection into white mice. These animals showed no ill effects from the largest dose injected, namely, 1 cubic centimeter.

For the immunization experiment, six half-grown rabbits were injected intravenously at three-day intervals with 1 cubic centimeter, 2 cubic centimeters, and 4 cubic centimeters, of the extract. No ill effects from the injection were noted. Twelve days after the last injection of extract these six rabbits and three normal rabbits were each injected intrave-

nously with living organisms of the same strains used in the preparation of the vaccine, in amounts equivalent to 3/10 of the 24-hour growth on one blood agar slant. Three days after this injection the first symptoms of

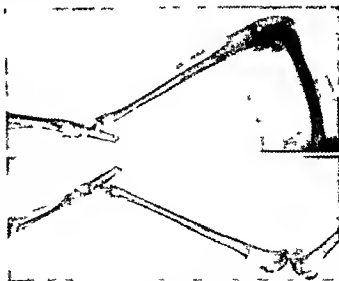


Fig 10 (above) Knee joint showing marked involvement in and about the joint with evidence of a destructive process involving the articular surfaces of the joint. Destruction is apparently most marked in cartilaginous structure

Fig 11 Roentgenogram of normal knee joint in similar position to that in Figure 10

lameness were noted in one of the control rabbits. All of the control rabbits showed joint involvement manifested by swelling and lameness, two of them showed involvement of all joints at various times during the entire period of the experiment and one apparently only of the hind legs. The treated rabbits showed no symptoms whatsoever except in the case of one animal which showed lameness for several days but upon autopsy no lesions were apparent.

The actual difference in the condition of the treated and control rabbits after they received an injection of living organisms is shown in a very striking manner by their weights which are given in Charts 1 and 2. The control rabbits all show an immediate loss in weight after the injection and at the end of 3 weeks only one had regained his original weight. The treated rabbits on the other hand gained or at least maintained their weight immediate-

ly after injection, and at the end of 3 weeks all except one showed a very decided increase. This together with the absence of symptoms in all but one of the group proves that the treated rabbits had acquired a resistance which protected them against a dose of living streptococci capable of producing an active arthritis in normal rabbits.

Although the number of animals in our experiment is small nevertheless we feel justified in concluding from the clear cut results obtained that protective inoculation against intravenous streptococcus infection in rabbits is possible by means of our specially prepared bacterial extract and that further investigation of its usefulness is fully warranted.

We wish to thank Dr Edward H. Hatton of Northwestern University Dental School for making animal experimentation possible for us and Dr Carroll Eugene Cook for taking the X rays.

THE PHYSIOLOGICAL SIGNIFICANCE OF THE GALL BLADDER¹

By J. G. REMYNSE, ROTTERDAM, HOLLAND
Head Surgeon of the Coolidge Hospital

AS regards the function of the gall bladder there is a difference of opinion among physicians. Up to a short time ago, most of the physiologists saw in the gall bladder a simple reservoir in which the bile or a part of the bile could be accumulated for a time, and probably made better fitted for the work which it is described as doing in digestion. The possibility has also been considered that the gall bladder may serve as a regulator, a steam kettle, through which the expansion of the bile ducts is regulated, and at the same time as an abductor of bile into the intestinal canal. Others take it for granted that the gall bladder contracts at certain times, and as a result a larger quantity of bile flows to the duodenum when the organs of digestion require more stimulation.

Tigstedt mentions in his compendium the fact that during periods of abstinence or fasting the bile flows not to the gut but into the gall bladder. Water is absorbed and the slime separated with the result that the bile becomes more concentrated. While bile is formed continuously in the liver it runs into the gut during digestion only. This physiologist further states that through the movement of the diaphragm during respiration a pressure is exerted which is of significance in the evacuation of the gall bladder. This is certainly not logical, as one asks himself immediately if during fasting the inspiration pressure of the diaphragm has been interrupted.

Van Hengel has asked in his dissertation on cholecystectomy, published in 1912 "What significance has the gall bladder?" He gives an exhaustive review of the different opinions as to the manner in which the bile is separated and the part played by the gall bladder. After critical consideration of the different conceptions and after experiments on animals he comes to the following conclusion: "The bile flows during periods of non digestion as well as during periods of digestion, a part to the gall bladder and the rest to the duodenum,

without hindrance from the sphincter of Oddi. During fasting the bile flows to the gall bladder until this is filled, the rest goes to the duodenum. After nourishment has been taken there should arise with peristalsis of the duodenum contraction of the gall bladder and of the bile ducts, in consequence of which there is an evacuation of the gall bladder and a temporary increased separation to the duodenum.

Zwaardemaker says in his physiology (3d ed. 1920) "The gall bladder forms obviously a reservoir wherein the bile may be stored in times of need. The wall undergoes rhythmical contractions 1 to 3 per minute. These contractions should be stimulated by the vagus and inhibited by the sympathetic, the expulsion should take place freely, with great force this would be indicated by the presence of the muscles.

It is in every way comprehensible that the question as to the significance of the gall bladder has come prominently forward, in accord with the extension and development of the surgery of the bile ducts. One of the principal arguments for or against cholecystectomy is closely connected with the significance to be ascribed to the gall bladder.

It is known that certain animals such as the horse, rat, and peccary, have no gall bladders, and that in human beings, in a few cases the pathological anatomist has observed an agenesis.² In all other animals the gall bladder is present, and is in no sense a rudimentary organ as is the appendix. From this it is to be inferred that the function of the gall bladder is not unimportant. In its early developmental stages it is extremely large. The way in which the gall bladder is connected with the liver differs in the different animals very much. In some cases there is complete separation in others they are closely connected sometimes one duct, or two or more bile ducts

¹Reeman I. Ueber die Phylogense der Gallenblase. Upsala Lakaref. Förh. 1921. xvi, 1.

flowing directly to the gall bladder. Whether those direct connections are only primary or secondary is not yet proved.¹

It would certainly be of interest to know, whether in animals having no gall bladder particular anatomical functions could be pointed out in which the non existence of the gall bladder is compensated for in one way or another. In the case of the horse with a liver weighing 4 to 5 pounds we find a choledochus as wide as a man's finger while the gall bladder is missing. The significance of the gall bladder as a reservoir is certainly of minor importance for there is a daily production of about 1 liter (32 liquid ounces) of bile. Compared with this amount of bile the capacity of the gall bladder is small.

Experiments on animals have done but little to give us a clear view on the function of the gall bladder. This is not astonishing because in performing experiments on animals we create a pathological condition and therefore we may not rely on the results so far as the uninjured gall bladder or bile ducts are concerned.

One thing of consequence which is proved by the foregoing and which is in accordance with Dr. Van Hengel's experiences is that the bile ducts always enlarge when the gall bladder is taken away. This enlargement is very pronounced when the gall bladder is removed with the ductus cysticus and is less pronounced when a part of the ductus cysticus is left. It seems that not only is the papilla Vateri influenced by the loss of the gall bladder but also that this end of the ductus choledochus becomes wider.

Yet every surgeon knows that in the clinic this phenomenon reappears. Almost always we find distended bile ducts when the gall bladder has been put out of function, either when it has been removed by an operation or through shrinkage or through chronic obstruction of the cystic duct.

About the existence or non existence of the so called sphincter of Oddi, opinions are divided. Probably there exists a sphincter working but disregarding the fact, whether this sphincter can be indicated anatomically or not the clinic teaches us that the normal

bile ducts are protected in any case against the entrance of the contents of the duodenum by a barrier, and not alone by the bile stream itself. The peculiar natural entrance of the ductus choledochus into the duodenum is difficult to replace by an artificial one without disturbance.

As one proof of this the case of a patient is given who is still in the Rotterdam Hospital. In this patient it had become necessary to plant the proximal part of the ductus hepaticus in the duodenum about a year ago because the end of the ductus choledochus was obliterated during cholecystectomy. The flow of bile returned to normal but every time an angiocholitis formed which must be ascribed to ascending infections along the intestinal canal.

Somewhat similar ascending infection is to be seen after the artificial implanting of the ureter into the bladder. The widening of the bile ducts always seen after the gall bladder is disconnected from the ducts, must be ascribed to the pressure which the bile exerts on the walls. The pressure inside the bile ducts is dependent upon different factors.

Various physiological influences are present. The quantitative differences in the separation of the liver bile, the movements of the diaphragm, the abdominal pressure, the different attitudes of the human body, pregnancy, the grade of swelling of the intestinal loops etc. are of influence on the situation of the bile ducts and the pressure inside the ducts. And the pathological factors are also of no less importance. Therefore we must take it for granted that the bile ducts possess a means by which they can act under altered internal or external conditions with the effect of differences in pressure. Apparently this is what happens when the gall bladder is removed—it possesses this means even though it must be regarded as a protecting reservoir for the bile ducts. If this protecting organ is removed then the bile ducts are not able to withstand a higher pressure, they lose their elasticity and become stretched.

The clinic teaches us that the gall bladder can be extensively stretched, usually without injury, probably because of the presence of muscles near other elastic elements. Often during laparotomy the surgeon sees the formerly

greatly distended gall bladder shrunk back to normal dimensions, not as a weak sack but with smooth walls showing no evidence that a swelling has been present. The muscles of the walls of the gall bladder have been for many people the proof of active participation of the gall bladder in the movement of bile into the duodenum, adapted to the lack of bile for the digestion within the intestinal canal. Others, however, who think these muscles are unfitted for this work, believe that evacuation of the gall bladder takes place through peristalsis of organs in the neighborhood, or through pressure of the diaphragm. It would seem that physiologists wanted to see an evacuation of the gall bladder after certain periods by some means or other in any case!

The experience of the surgeon is contrary to this. During a laparotomy nothing is found that would prove that the gall bladder takes an active part in the discharge of bile to the gut canal. Under normal conditions the gall bladder is always full, we never find it absolutely empty, the surgeon does not see the active working, the contraction of the peristalsis even during long and repeated observation. We also get no impression that the filling of the gall bladder is very dependent on the digestion. During fasting the gall bladder is certainly not enlarged as a rule, as one might think it would be on considering reports about the function of the gall bladder.

Indeed laparotomy is always performed just after a fasting period.

Under most pathological conditions, the gall bladder is considerably enlarged. Therefore, I recall that I as well as others have observed an enlargement of the gall bladder in acute pancreatitis. This enlargement is a natural result of higher pressure in the bile ducts. The experiments on dogs by Auster and Crohn¹ in 1922 agree with this fact in all respects. After laparotomy and duodenotomy, methylene blue was injected into the gall bladder. After this the duodenal mucous membrane near the papilla Vateri was stimulated with magnesium sulphate. More bile was then evacuated, though no bladder bile. The gall bladder kept the bile independent of the digestive conditions. Attempts made to cause the gall bladder to con-

tract through nerve excitement failed. Also strong electric incitement of the gall bladder was without effect. A lot of experiments with the aid of sterilized suspensions of fine substances such as bone ash and carmine, have shown that the gall bladder holds its contents for a long time, sometimes for days. Also, in the presence of gall bladder fistula, the impression is not received that the bile stream is controlled by contractions of the gall bladder. With certain regularity the bile drips through the fistula, occasionally in quicker tempo through the influence of intestinal pressure.

When the surgeon empties the gall bladder with the finger, it refills gradually and irregularly, according to the amount of liver bile excreted. Here, too, the argument seems unwarranted that a sucking process may be present in the gall bladder. At the same time, the gall bladder is well able to rid itself of a part of its contents in a short period. It is, however, a question whether in the first place bile escapes along the ductus cysticus. The anatomical relations of the gall bladder, ductus cysticus, hepaticus, and choledochus are not such as to give the impression that nearly all of the bile—as sometimes is thought—reaches the ductus choledochus after having passed into the gall bladder. The spiral course of the ductus cysticus otherwise difficult to explain does explain the stretching to which the gall bladder and ductus cysticus are exposed. The evacuation of the gall bladder is not easy via the ductus cysticus. This fact can be demonstrated by attempting to empty the gall bladder with the fingers. Considerable resistance must be overcome.

It is known that bile is found in more concentrated form in the gall bladder than in the bile ducts and this is because much fluid can be resorbed from the gall bladder. The extensive lymph apparatus furnishes this resorbent power. Besides water, which seems to be worked up quite easily, other substances can also be taken up, in fact all the elements of bile can be carried off with the lymph. Indeed, by an enclosure of the ductus cysticus is often found a watery fluid containing slime only, of which the former content was bile. Now and then cholesterol is taken up in such very large quantities through the mucous

¹Proc Soc Exper Biol & Med 1922 in 30

membrane of the gall bladder that it fills up the villi of that membrane (strawberry gall bladder)¹ The gall bladder can lose most of its contents by resorption, and in this sense it becomes *significant as a protective factor*

The experiments of Rous and McMaster in 1921 showed that the gall bladder has considerable power of resorption. They performed experiments with dogs and pointed out that the amount of bile in a gall bladder completely empty at the beginning of an experiment which was filled gradually with liver bile, was reduced in 24 hours to one tenth the original amount, this reduction being less when the gall bladder was filled in advance with bile containing a certain amount of pigment.

In the clinic, the significance of the gall bladder as a resorbing organ under pathological conditions, becomes manifest. Others have pointed this out and I have observed in about 6 cases that the appearance of so called "white bile" in the bile ducts marks a pronounced change in the gall bladder, so much so that it may be doubted whether there may not be ascribed to it some resorbent power. The so called white bile may be found sometimes when the bile ducts have been obstructed in cases with high grade icterus and it consists of water with some slime (as this may be found in the gall bladder alone). This white bile is not often found in the bile ducts generally when the ducts have become obstructed they clearly contain bile, sometimes a very strong, thick bile.

It is to be in some way understood that the contents may become watery only when the gall bladder absorbs little or not at all. Only in that case is the expansion within the bile ducts so great that the secretion of bile from the liver is interrupted if the gall bladder resorbs efficiently then the liver continues—it may be poorly—giving off bile to the bile

ducts. By means of the white bile in the bile ducts, I have always been able to find an enlargement of the ducts.

The gall bladder is therefore not a reservoir from which the contents stream in and out under the influence of muscle contractions but more an organ that controls the expansion of the bile ducts, first by a power to become greatly enlarged and retain much for a certain time, and second by a strong resorbent power, through which in a short time much fluid can be carried off.

The internal and external parts of the mucous membrane of the gall bladder are in absolute harmony with this resorbent power. During fasting the gall bladder is certainly not without necessity enlarged, much more does the rich bile stream during digestion give cause for filling of the gall bladder. The gall bladder does not take an active part in the bile separation. Only a part of the liver bile runs into the gall bladder and probably only a small amount of its contents return via the ductus cysticus.

In the gall bladder rules a relative rest. This rest and the concentration which is brought about within the gall bladder through resorption are in accord with the fact that stones are found and formed within the gall bladder so often. In this connection the question arises whether changes in the colloid formation or in inflammation, or both, are the prime cause for the forming of these stones. Also the well known fact that bacteria may remain for a long time in the gall bladder is in accordance with these conceptions.

CONCLUSIONS

The fact that removal of the gall bladder is not fatal may not be accepted as proof that the function of the gall bladder is not important. Of more significance is the manner in which the organism adapts itself to the loss of the gall bladder.

¹Dodd W. H. m. Studies in gall bladder pathology. B. J. Surg. 1921 N. 30.

*Rous and McMaster. J. Exper. Med. 1921 xiv No 2.

CLINICAL SURGERY

FROM THE UNIVERSITY CLINIC FOR WOMEN'S DISEASES, BERLIN

THE TECHNIQUE OF ABDOMINAL HYSTERECTOMY FOR CARCINOMA OF THE UTERUS¹

BY PROFESSOR DR. K. FRANZ, BERLIN, GERMANY
Director of the University Clinic for Women's Diseases at the Charité, Berlin

FOR twenty one years, I have used the abdominal route as proposed by Wertheim in operating upon medullary carcinoma of the uterus. The technique to be described here, was evolved in the first five years and has not been changed essentially in the last sixteen years.

The abdomen is opened through a transverse aponeurotic incision (Pfannenstiel). Other incisions have no advantages over this one and if used results a tendency to slow healing and the danger of postoperative hernia. This latter is hardly to be expected when the transverse incision is used.

The incision in the aponeurosis is made approximately on a level with the anterior superior spines, and is 12 to 14 centimeters long. The aponeurosis is well freed upward and downward. If a self retaining retractor is inserted and well stretched, this incision gives sufficient exposure. The uterus is grasped with forceps and pulled upward and over to one side as much as possible. If the surgeon stands on the right of the patient, the uterus will be pulled over to that side. Two forceps are applied now on the left suspensory ligament of the ovary so as to include the ovarian vessels, and two forceps are placed on the round ligament (Fig. 1). The ligaments are cut between the forceps only so far as they grasp the ligaments. Care must be taken not to take too deep a bite in the suspensory ligament as the ureter may be injured. After the ligaments are cut, the forceps are pulled apart so that the intraligamentary tissue is exposed (Fig. 2).

The same thing is done on the right side. The ligated adnexa and the stumps of the round ligament can be tied together on the anterior surface of the uterus in order to get them out of the way. Now the left parametrium is exposed, if the surgeon is on the right side, with the help of blunt dissecting scissors and tissue forceps. It is the uterine vessels that we must look for and

not the ureter. A clear anatomical dissection must expose them. If this procedure is followed, the ureter will also be visible without further search. It lies on the posterior layer of the broad ligament which is now pushed toward the midline and is crossed by the uterine vessels. It can be recognized, if there is any doubt as to its identity, by the fine vascularization of its surface. If there is still doubt, gentle squeezing with a forceps will elicit peristaltic movements.

With two clamps, the uterine vessels are grasped at their origin from the hypogastric vessels. The clamps are placed far enough from each other to permit a section between them. In Figure 3 the second clamp has been removed so that the structures will show more clearly. If the uterine artery and vein lie together, usually the vein lies under the artery, then they are grasped with one bite. If they lie apart, then they must be clamped separately. The proximal clamp on the vessels is immediately replaced by a ligature of catgut. Traction is made on the distal clamp and with it on the part of the vessels that tend toward the uterus. Thereby an additional portion of the ureter is exposed. However, it should not be touched at all.

The surgeon now changes sides. If he stood on the right before, he will now tie from the left side the right uterine vessels and expose the right ureter as described above.

After the uterine vessels have been tied on both sides and both ureters are exposed, the uterus is brought back to the midline and pulled upward. The peritoneum of the bladder is picked up with a tissue forceps and transversely incised at the point where it bends over from bladder to uterus (Fig. 4). The bladder is dissected away from the cervix in the midline only to an extent sufficient to expose the border between the bladder and the wall of the cervix. The surgeon still stands on the left side of patient. The uterus is pulled over

¹The description is taken from the author's book on *Gynecologic Operations* which was published in 1925 by Julius Springer of Berlin. The illustrations are diagrammatic drawings of the colored photographs shown in this book. Also the clinical results of this operation on both primary and late are discussed there in detail. This article has been translated from the German by Geza de Takats, M.D.

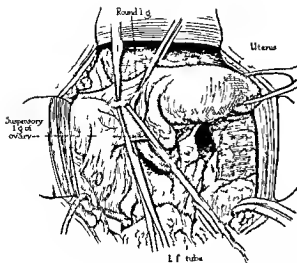


Fig. 1. Abdominal operation for carcinoma of the uterus. The uterus is grasped with a forceps and pulled well over to the right in order to put the left ligaments on a stretch. Both the suspensory ligament of the ovary with the ovarian vessels and the round ligament are to be sectioned between two clamps.

to the left in order to free the bladder laterally from the uterus and to dissect the ureter down to its orifice into the bladder. This part of the operation is the most interesting from an anatomical point of view and technically the most dangerous. There is the possibility of injuring the ureter or bladder especially if an inflammatory or carcinomatous infiltration around the ureter is present. The tissues around the ureter can

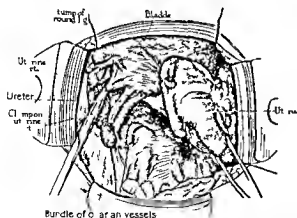


Fig. 3. The uterus is pulled over to the right. The left broad ligament is exposed with the uterine artery. A clamp is applied at its origin. The uterine artery is seen on its course toward the uterus with an anterior branch to the bladder. On the medial surface of the broad ligament the ureter is seen. The ligature is left long on the ovarian vessels.

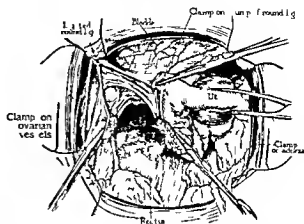


Fig. 2. The uterus is still pulled over to the right. The ligaments have been cut between clamps and pulled apart so as to expose the intraligamentous tissue. The lateral clamp on the round ligament has been replaced by ligature.

be seen in Figure 5. One must know the exact course of the ureter. Down to the point where it crosses the uterine vessels the course is straight. When traction is exerted on the uterus to the side and upward the ureter takes up a similar course and forms an arch upward and mesially lying immediately next to the uterus. The tissue forceps picks up the bladder wall and the parametric tissue above the ureter is sectioned. One or two veins are usually cut at this point. They are ligated immediately. Generally the ureter becomes visible at this point. The incision is now continued laterally and the ureter is dissected away from the wall of the cervix and the medial layer of the broad ligament so that it is

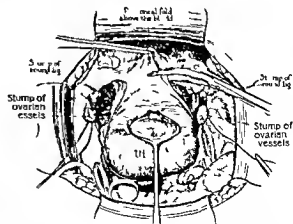


Fig. 4. The uterus is brought back to the midline and drawn upward. The peritoneum above the bladder is picked up with a tissue forceps and is transversely incised with a pair of scissors in the vesico-uterine fold.

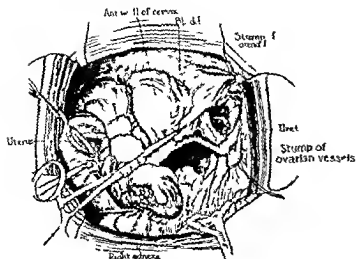


Fig 5 The uterus is pulled over to the left. The ligatures on the ligaments have been tied together on its anterior surface the suture on the right ovarian vessels has been left long. Between the layers of the broad ligament the ureter is visible as it is dissected away from the medial surface. The bladder is visible in the front separated from the anterior wall of the cervix. To the right a clamp is exerting traction on the parametric tissue that extends from the bladder to the lateral wall of the cervix disappearing under the ureter.

freed in all directions for a length of 5 to 6 centimeters, if possible for a greater distance (Fig 6). The ureter is followed farther down to the bladder, into which it opens in a tangential direction. This dissection is done with tissue forceps and scissors. The bladder must also be freed below the ureter from parametric tissue. Now the vesicovaginal veins become visible and

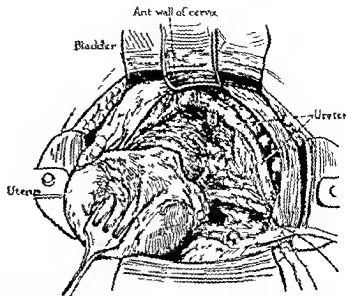


Fig 6 The uterus is pulled to the left and upward. The bladder is dissected away from the cervix and vaginal wall. The ureter is pulled down to its opening into the bladder. The parametric tissue on which the ureter lies is still left in place.

they should be carefully protected from injury. The surgeon changes places again and dissects in the same way on the other side. When he is ready, the following topography is seen (Fig 7). Both ureters are free. The bladder is dissected away from the cervix, from the anterior vaginal wall and laterally from the parametric tissue so

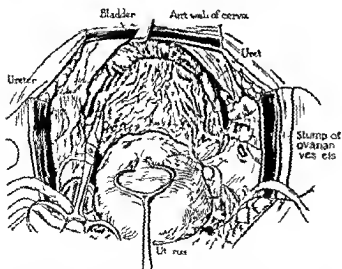


Fig 7 The uterus is in the midline and pulled upward. The bladder is well freed from the anterior cervical and vaginal wall as is recognized by the distance between the bladder and the free edge of the peritoneal fold on the anterior surface of the uterus. Both ureters are visible clear down to the vesical orifice. On the left side a clamp is applied on a small vessel.

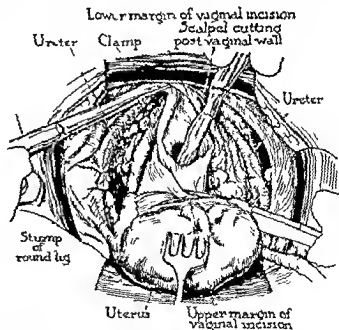


Fig 8 Transverse incision of the anterior vaginal wall. A Colles forceps holds up the upper lip of the vaginal incision. Another clamp grasps the lower margin of the vaginal wound. The scalpel separates the posterior wall of the vagina transversely.

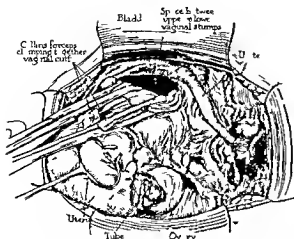


Fig. 9. Anterior and posterior vaginal wall are grasped and held together with three Collin forceps. The right ureter is free down to its vesical end and retracted with a ureteral hook. The pelvic connective tissue of the right side is amply exposed.

far as the individual case requires it. Now the gauze pack in the vagina is removed from below the vagina is opened with a transverse incision from above and the anterior margin of the vaginal wound is grasped with a Collin forceps. Through the opening in the vagina the posterior wall is also incised transversely with a long be cutting scalpel (Fig. 8). The posterior margin of the vaginal wound proximal to the uterus is also grasped with a forceps and pulled forward. A gauze pack is now inserted through the anterior and posterior openings in the vagina and carried farther down to pack away the rectum from the upper part of the posterior vaginal wall. The vagina is amputated with a circular incision and the edges of the vaginal wound are grasped together with two or three Collin forceps so that the vaginal cuff is closed (Fig. 9).

If traction is made on the proximal vaginal stump and the ureter is held aside with a special retractor (Fig. 10) then the whole parametrium and paracolpium is exposed and it depends entirely on the surgeon how much tissue he wishes to remove both laterally and downward. Not many vessels must be cut at this point. There is a vein on the lateral wall of the vagina, another one farther to the side that comes from the bladder, one or two branches that go downward to the dependent part of the wound and a hemorrhoidal artery going to the rectum. There is generally a very small vessel in the fold of the Douglas pouch. The vessels are best exposed with blunt dissection with the scissors and three

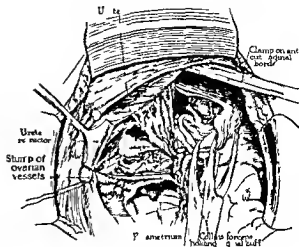


Fig. 10. Anterior and posterior vaginal walls are held together with two Collin clamps and pulled upward. The left ureter is retracted laterally with a special hook. The left parametrium and paracolpium is exposed as far as the lateral wall of the pelvis and is split into three well separated strands of fibers. Toward the symphysis a clamp is applied on the anterior vaginal wall below which the lumen of the vagina is visible.

to four forceps are usually enough on each side. If the left side is dissected out the position is again changed and the right side cleaned out. Now the uterus is attached only to the right peritoneal fold in the Douglas pouch and as the rectum is pulled up with the traction on the uterus care must be taken not to open the rectum when the peritoneum is separated at the bottom of the pouch. Only at this stage should the uterus be removed.

All this happens with the surgeon looking constantly into the pelvis from above; he does not have to turn his head to see from the back what he is cutting.

The uterus being removed the lymph glands must be excised. The surgeon remains on the left side as he started out originally on the right. If the stump of the round ligament is brought forward with a forceps and the ovarian vessels with their ligatures left long are drawn up then the region of the large vessels is exposed. The tissue over the external iliac artery is picked up with a tissue forceps and the large vessels dissected free as far as their origin from the common iliac artery. The angle formed by the external and internal iliac arteries especially should be completely cleaned out. This will expose the obturator nerve and the obliterated umbilical artery. The whole dissection can be done with out any bleeding. The same thing is now performed on the left side. The connective tissue

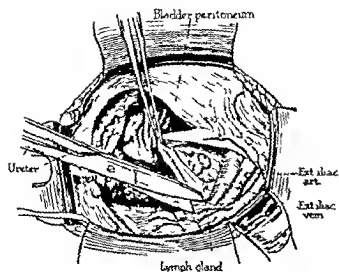


Fig. 11 Removal of connective tissue from the triangle of iliac vessels together with the lymph glands. Dissection of the great vessels

around the large vessels and in the triangle formed by the two iliac arteries should be removed in all instances, irrespective of whether enlarged glands are present or not

We have then the following steps in the operation. The surgeon stands on the right side of the patient and

- 1 Ligates the ovarian vessels and those of round ligament first on right then on left side
- 2 Ligates the uterine vessels and exposes the ureter on the left side

The surgeon goes over to the left side and

- 3 Ligates the uterine vessels and exposes the ureter on the right
- 4 He makes a transverse incision of the peritoneum over the bladder and separates the bladder from the wall of the cervix
- 5 He dissects out completely the right ureter. The surgeon changes places and does a
- 6 Complete dissection of the left ureter
- 7 He incises the anterior and posterior vaginal wall. The rectum is packed off and the vaginal cuff is closed with forceps over the portio
- 8 He removes the left parametrium and para colpium
- 9 Removes the right parametrium
- 10 Extirpates the lymph glands and connective tissue from the great vessels and the vascular angle on the right side

The surgeon changes his place and

- 11 Extirpates the lymph glands and connective tissue above the great vessels and the iliac angle on the left side

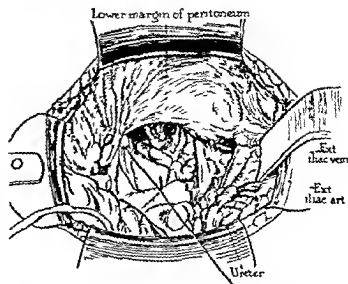


Fig. 12 The wound surface is covered with peritoneum. Beginning from the left stump of ovarian vessels the two peritoneal margins are united with a continuous catgut suture. The suture is completed to a small extent on the right. The wound is still open. The ureter and large vessels are visible

In case the surgeon begins the operation from the left side of the patient, the sequence of manipulations will be correspondingly reversed

The reconstruction of the wound is simple. A strip of gauze is passed from above through the vagina, the upper part of which is loosely packed. The gauze is pushed down flush with the opening in the vagina. It should not touch the wound surface of the pelvic cavity. The pelvic wound is covered with peritoneum by a continuous catgut suture of the anterior and posterior peritoneal margin (Fig. 12 and 13)

This method has been standardly used by us

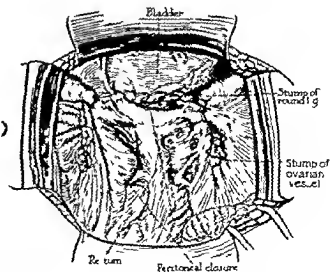


Fig. 13 The peritoneal suture is completed. The wound is entirely covered

in the last 16 years. Essential changes have not been made since that time. It is as simple as this anatomically and technically complicated operation can be made. The time required is from 30 to 50 minutes and there is very slight loss of blood. This plan is the result of several experiments that lasted 5 years. I stressed at that time the point of removing all tissue around the uterus and vagina possibly with the glands too in one mass and then opening the vagina as a last phase with the idea of keeping the infected vagina with the broken down carcinoma closed to the end of the operation and so diminishing the danger of infection from this source.

However, this procedure has its special dangers that were not in keeping with the expected advantages. If one proceeds to dissect down in the pelvic connective tissue after the ligation of the uterine vessels and exposure of the ureter, then one encounters the congested veins that drain from the vagina, bladder, and uterus into the hypogastric veins. If these are injured without preliminary clamping which happens often in spite of the greatest care, then a strong venous bleeding may take place which floods the field of operation and makes orientation difficult. The control of this bleeding is difficult because the veins on the lateral wall of the pelvis are immovable and can tear easily if grasped with forceps. Furthermore ligatures are difficult to make in this deep and narrow surgical field and hæmostatic sutures may easily result in more bleeding from neighboring veins. All these dangers are avoided if the technique described is followed.

The reconstruction of the wound also was not so simple before.

In order to diminish the wound surface of the pelvic tissues and to prevent bladder disturbances, the peritoneum of the bladder was united to the anterior wall of the cervix and the posterior peritoneum was sutured to the posterior vaginal wall. Above these sutures the peritoneum was closed with a continuous catgut suture. The lateral wound surfaces of the pelvis have been drained with gauze and this drainage kept in for days. All this is unnecessary and may result in the opposite of what one hopes to attain. Instead of an earlier and smoother reconvalescence a retardation and complications in the healing process may occur. The inserted gauze holds the surfaces of the wound apart, causes increased secretion and may cause a necrosis of bladder and ureter wall. Every operation should be as simple as possible, especially one that takes much time and one that has its technical difficulties and is not without danger. This is true of the simple cases in which the carcinoma is limited to the uterus and the parametria are free, the uterus movable. In complicated cases, in which the carcinoma involves the neighboring tissues, when the uterus is fixed by pelviperitoneal adhesions or rigid and infiltrated parametria, the technical difficulties are increased and the danger of surgical interference augmented. Only the surgeon will be master of the situation who follows a rigid outline of a surgical plan that has proved to be the safest and who uses a clear anatomical dissection which will obtain ample exposures.

FROM THE CLINIC OF DR TERRI AT UNIVERSITY OF CALIFORNIA
THE TECHNIQUE OF PARTIAL THYROIDECTOMY

By H H SEARLS M.D. SAN FRANCISCO

HYPERPLASIA (exophthalmic goiter) and adenoma of the thyroid are the two common types of goiter requiring surgical treatment for relief.

In operating for goiter, because of the anatomy and physiology of the thyroid certain dangers and complications peculiar to the procedure must be constantly borne in mind. The extreme vascularity of the gland makes the management of hæmorrhage an outstanding feature of the technique of resection. Hæmorrhage may occasionally reach alarming proportions. The accident of postoperative hæmorrhage, though rare is far more serious. The resulting condition is one of extreme emergency, not alone from the loss of blood, but because of the severe pressure exerted on the trachea by the rapidly increasing hæmatoma. Because of their proximity to the posterior capsule, injury to one or both recurrent laryngeal nerves may occur with resulting hoarseness or loss of voice. A similarly close relationship may be

cause for injury or removal of the parathyroids, resulting in postoperative tetany.

Nearly always in toxic goiter patients (especially those with hyperplasia), there is an exacerbation of all the signs and symptoms of hyperthyroidism for the first 48 hours following operation. In the advanced case one may even encounter here an acute delirium. More commonly evidence of the action of toxins on the myocardium is shown by auricular fibrillation, flutter, etc.

Following the lead of Dr H S Plummer all cases of hyperplasia are given 10 minims of Lugol's solution three times daily for from 7 to 10 days pre-operatively. Generally the patient is permitted to remain in bed at home during this period, entering the hospital only on the day before operation. Digitalis is administered pre-operatively only to those patients with cardiac decompensation, as evidenced by œdema, enlarged liver, etc. Other medication consists of a soporific on the evening before operation and the pre-operative hypodermic of morphine and scopolamine administered 45 minutes before the induction of anesthesia.

Local preparation consists in shaving the field of operation, cleansing with green soap and water followed by alcohol and ether, and applying a sterile dressing. In female patients, shaving may be done on the evening before operation. In male patients it should be done on the morning of operation. After anesthesia has been induced, the field is again cleansed with alcohol, ether, and

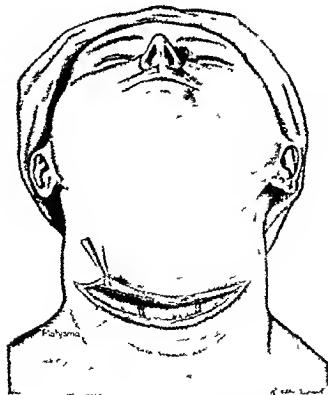


Fig 1 Incision developed through platysma

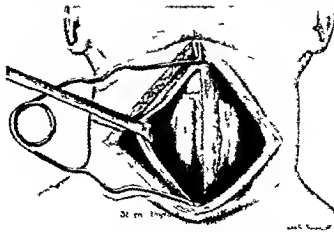


Fig 2 Flaps dissected free. Spring retractor in place

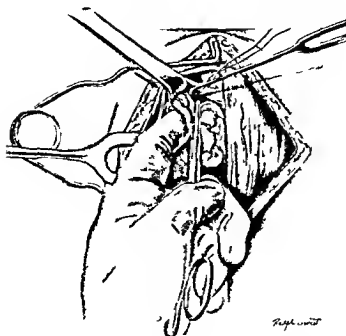


Fig. 3 Ligation of superior pole (hyperplasia)

an alcoholic solution of biniodid of mercury (1:1000)

While the patient is on the operating table extension of the neck is gained by the proper placing of small pillows and folded towels. The anesthetist obtains this position before inducing anesthesia, being governed by the patient as to the degree of extension which can be tolerated. When there is a substernal or retrotracheal goiter very little extension will be permitted because of compression of the trachea. The placing of the patient in the proper position on the table is of prime importance in gaining the best exposure. Nitrous oxide-oxygen anesthesia without addition of ether and without local infiltration is used on all cases.

The true Kocher incision is employed (Fig. 1). It is from 12 to 15 centimeters in length, slightly curved with the concavity upward, lying in the grain or fold of the skin of the neck. Its lowest point is about 3 centimeters above the suprasternal notch. It extends an equal distance on each side of the midline. It is first outlined with the point of the knife in a fold of the skin while the patient's head is flexed by the anesthetist. If a wrinkle is present at the proper location it is utilized as the line of incision. A crossline at the midpoint is of aid in accurate closure. With the head again extended the incision as outlined is

developed through the subcutaneous tissues and platysma to the superficial layer of the deep cervical fascia, bleeding points being caught with small straight (Kelly) hemostats. The upper and lower flaps are then dissected free as high as the thyroid cartilage of the larynx and as low as the suprasternal notch, the excellent plane of cleavage between the posterior surface of the platysma and the anterior surface of the superficial layer of the deep fascia being used. A few vessels are cut in this plane and these are ligated with No. 000 plain catgut. A wire spring retractor is then placed so as to hold the flaps apart (Fig. 2). The cervical fascia is next incised in the midline from the lower border of the thyroid cartilage to the suprasternal notch and care is taken to avoid the anterior jugular veins. By sharp and blunt dissection the sternohyoid and sternothyroid muscles are lifted off the capsule of the gland. Very rarely, and then only in the unusually large goiters, transection of the ribbon muscles on one or even on both sides may be necessary to obtain sufficient exposure. When transection is used, the level of transection should be as near the thyroid cartilage as possible in order to preserve innervation of the muscles. With the gland exposed the operator carefully palpates both lobes and the isthmus with thumb and index finger to determine their consistency and the presence or absence

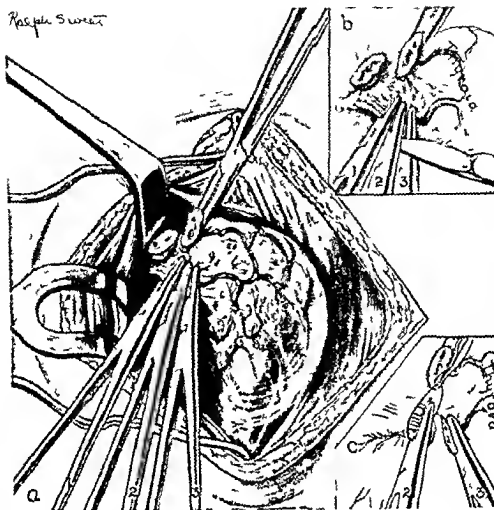


Fig. 4 Three clamp method of resection

of adenomata. If the information thus gained does not suffice an exploratory thyroidotomy may be performed, splitting the lobe where an adenoma is suspected and suturing it afterward.

The technical steps of the actual excision of thyroid tissue differ in the operation for hyperplasia from that for adenoma. The first step in the hyperplastic case is ligation of the superior pole. This is done with the aid of the Lahey ligature carrier, using No. 0 plain catgut doubled (Fig. 3). The pole is then transected between clamps immediately below the ligature. Working from above downward and toward the isthmus the resection is completed using the three clamp method as illustrated (Fig. 4). A very small amount of thyroid tissue is left at the upper and lower poles and in the tracheo-oesophageal groove (Fig. 5). Permanent haemostasis is obtained by multiple ligatures of No. 0 plain catgut tied in the groove formed by haemostat No. 1 as shown in Figure 4 C. A similar resection, after ligation of the superior pole is carried out on the other side. As the trachea is approached, care is taken to

leave a thin layer of thyroid or at least the pretracheal fascia over it (Fig. 5) to prevent postoperative tracheitis a common complication which may develop if the outer coverings of the trachea are damaged. The capsule of the gland should be left intact posteriorly and at the upper and lower poles so as to protect the recurrent laryngeal nerves and parathyroids.

It will be noted that only the smallest calibers of plain catgut are employed—No. 000 as ligatures in the development of the wound and as sutures in the closure, No. 0 as ligatures on the gland itself. It is believed that the use of such fine catgut is of considerable importance in the healing of the wound and permits of closure without drainage. Absorption of catgut from a wound is by way of the lymphatics. If large amounts of catgut are used the lymphatics are filled with it. Drainage through the lymphatics of other wound products is then poorly handled and a marked retardation of healing results. A very large number of ligatures and sutures are employed in operating on the thyroid. An appreciable reduc-

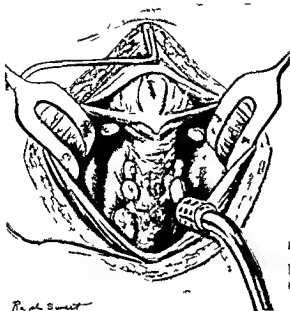


Fig 5 The wound after irrigation

tion in the actual quantity of catgut used can be obtained by using the finest caliber commensurate with safety

If the thyroid is adenomatous the resection is somewhat altered. Superior pole ligation is used only in the larger adenomatous goiters. If a single or a small number of adenomata are encountered they may be shelled out of the thyroid (enucleated). If many are found a partial Jobec tomy is planned so as to include all of the nodules. It is essential that all adenomatous tissue be removed even though a very small amount of gland proper be left. The adenoma does not supply normal thyroid secretion and cannot therefore take the place of normal gland. Failure to remove all adenomatous tissue is a common cause of recurrent goiter.

In both types of goiter the wound is thoroughly lavaged with Ringer's solution before closing. This serves to cleanse the tissues and to demonstrate any remaining bleeding points. Suction is employed to carry away the Ringer's from the wound (Fig 5).

Closure is made in layers, using interrupted sutures of No. 000 plain catgut. First the sternothyroids are approximated in the midline then the sternohyoids. A third line of sutures with buried knots repairs the cervical fascia. Similar sutures with buried knots approximate the cut edges of the platysma. The skin closure is accurately made using Michel clips. Drainage is employed only in the very large goiters with sub

sternal extension. The dressing is of folded gauze and adhesive.

The non-toxic case requires very little postoperative attention. Codein and aspirin as a powder administered 30 minutes before meal gives relief from pain caused by swallowing.

For the toxic case much can be done during the first 48 hours after operation. The so-called postoperative crisis must be met. Here the patient's temperature rises, her pulse becomes very rapid and she is quite restless. The most important single item in postoperative care is the forcing of fluids. Hypodermoclysis and in the more severe cases intravenous glucose are invaluable. To control the fever icebags as suggested by Dr. Crile are used. In hyperplasia Lugol's continued postoperatively is of great value in preventing a severe reaction. In advanced cases it may be administered in dilute starch solution by rectum (3 cubic centimeters of Lugol's solution in 100 cubic centimeters of starch water) while the patient is still on the table.

Postoperative complications are infrequent. Of these tracheitis is most often seen. It is easily relieved with steam inhalations. Rarely postoperative hemorrhage is encountered. It demands immediate relief for the pressure within the wound causes compression of the trachea with stridor followed rapidly by complete tracheal collapse and asphyxia. The wound must be opened at once to relieve the pressure on the trachea and the bleeding point found and ligated after which the wound may be re-sutured with drainage.

Postoperative tetany results if several of the parathyroids are removed, injured or lose their blood supply. It may be recognized early in its development if an attempt to elicit Chvostek's sign is routinely made on postoperative cases. Generally it is easily controlled by the protracted use of calcium bromide and lactate by mouth. The recently developed parathyroid extract (parathormone Lilly) is proving of great value in the more severe cases.

The patient rarely takes anything but fluids for 48 hours but usually is able to eat a fairly hearty luncheon on the second day postoperative. From then on in the toxic cases a high calorie diet is offered excluding tea, coffee, red meats and extractives. The patient is given additional nourishment between meals.

In the routine case, the immediate convalescence is rapid. Clips are removed and the patient is permitted to be up in a wheel chair on the third day and leaves the hospital on the fourth day.

Prognosis differs in the two types of cases. The patient with adenomatous goiter, unless her myocardium has been badly damaged by long neglect, enjoys a rapid and complete convalescence, being able to resume her routine activities in from 2 to 6 weeks. The patient with hyperplasia, on the other hand, usually requiring from 2 to 4 months to gain complete relief. Eventually an excellent recovery is the rule.

In this clinic the following points in technique are given special emphasis:

- 1 Nitrous oxide oxygen anaesthesia without adjuvant
- 2 A constant endeavor to avoid unnecessary injury to tissue—atraumatic surgery

- 3 Complete haemostasis
- 4 Rare transection of the ribbon muscles
- 5 Plain catgut of the smallest calibers as ligatures and sutures
- 6 Wound lavage before closure
- 7 Closure without drainage
- 8 Careful anatomical closure in layers

REFERENCES

- 1 PLUMMER AND BOOTHBY: The value of iodine in exophthalmic goiter. *J. Iowa St. M. Soc.* 1914, xiv, 66.
- 2 CRILE: The Thyroid Gland, p. 26;—Icebag therapy.
- 3 COLLIER J. B.: The extraction of a parathyroid hormone which will prevent or control parathyroid tetany and which regulates the level of blood calcium. *J. Biol. Chem.* 1925, No. 63, p. 305.

FROM THE CLINIC OF THE SANTA CASA DE MISERICORDIA THE TECHNIQUE OF APPENDECTOMY

By JOSÉ DE MENDONÇA M.D., F.A.C.S. RIO DE JANEIRO, BRAZIL

Associate Surgeon, Santa Casa de Misericórdia de Rio de Janeiro. Acting Surgeon, Beneficência Portuguesa de Rio de Janeiro.

IN appendicitis there is more danger from the disease than from operation, for the right kind of anaesthesia and careful technique make the latter absolutely safe.

But the danger from anaesthesia is not to be underestimated, chiefly from general anaesthesia, as in the majority of cases the patients are intoxicated. In patients with intense intoxication, advanced nephritis, emphysematous heart disease, and lung disease, we prefer infiltration of the field of operation with a solution of 1/2 per cent novocain serum adrenalin or spinal anaesthesia with 7 to 10 centigrams of novocain dissolved in cerebrospinal fluid.

In patients susceptible to suggestion and with not a very thick panniculus adiposus, infiltration is preferable as it is the least harmful of all methods of anaesthesia. Except under these conditions we habitually use ether anaesthesia given with an Ombredanne mask, preceded by ethyl chloride to shorten the period of excitement. Whenever possible the patient is purged before operation or given an evacuating enema the evening before and a diet of sweetened liquid until the operation. Whether the appendicitis is acute or chronic we determine the functional value of the liver and kidneys beforehand and also the exact topography of the caecum and the presence of any exudates. Accurate diagnosis and good technique are the

chief means of eliminating danger in the operation. X rays, palpation, light percussion, and a careful history are the best helps in making a diagnosis.

If the caecum, movable or not, descends to the iliac fossa as it ordinarily does, we use a technique similar to that of McBurney which will be described in detail in this article. If the caecum is in some other part of the abdomen the incision should be made there, as the appendix is the chief focus of inflammation and this is the only way of finding the portion of the intestine to which it is attached.

We make a longitudinal incision in the skin, 4 to 9 centimeters long depending on the thickness of the subcutaneous layer of fat, 3 centimeters in ward from the right anterior superior spine of the ilium. The middle of the incision thus cuts a horizontal line which passes through this spine. With the index finger wrapped in a compress we dissect the skin from the aponeurosis of the external oblique. As it retracts, the hemorrhage stops, and only occasionally we have to apply one or two hemostatic forceps. The sterile compresses are then brought up to the edge of the wound where they are fixed with tenaculum forceps.

With a guarded Pean's forceps (Fig. 1a) we cut in the direction of the fibers of the aponeurosis of the external oblique, exposing the internal oblique which, with the aponeurosis of the transverse, will be cut with the same forceps.

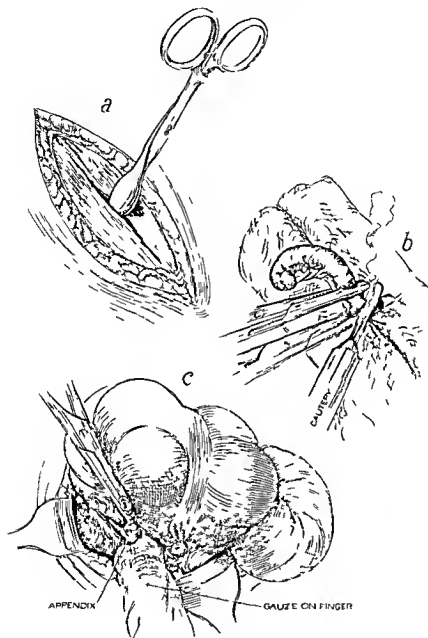


Fig. 1. Technique of operation

The tissues being retracted the peritoneum appears, lined with the fatty subperitoneal tissue the œdematous appearance of which in acute cases shows the presence of exudate or peritoneal adhesions. With the greatest care a fold of peritoneum is lifted up and incised with short incisions 6 millimeters long from the fixation forceps until a cavity or an adherent organ is encountered. After the peritoneum is opened in cases of phleg-

monous appendicitis with defensive adhesions or abscess the adhesions must be freed in the direction of the wall of the iliac fossa in order to approach from the outside the inflamed appendix or the abscess within whose wall it is found, more or less destroyed by the suppuration. In cases of chronic appendicitis we retract the wound immediately with Gosset's small automatic retractor, grasp the omentum or small intestine to one

side of the midline if they present, and deep down on the wall of the iliac fossa find the ascending colon, recognizable by its opaque whitish color and by its longitudinal band. Following this part of the intestine from above downward we necessarily come to the cecum and therefore to the appendix. If this manipulation fails as may happen in case of movable cecum, a loop of ileum may be grasped and followed up to its insertion into the large intestine, where the cecum is found and a few millimeters lower the base of the appendix.

Keeping the cecum in sight we come to the lower end of the longitudinal band where the appendix is found, free, involved in adhesions, or hidden between the folds of the mesocecum. If it is free it is ligated and the meso appendix cut the base of the appendix is crushed, ligated, and extirpated with the thermocautery (Fig. 1b) and the stump buried by means of a purse string suture or Lembert's sutures. If it is involved in adhesions, it is dissected free from base to tip or from tip to base, providing for hæmorrhage at the same time by means of forceps for which ligatures will be substituted later. If it is hidden between the folds of the mesocecum the peritoneum is incised, beginning with the lower end of the upper longitudinal band, freed from the intestine at the base of the appendix (Fig. 1c) and the appendix is dissected free with the finger wrapped in gauze.

In acute appendicitis accompanied by peritonitis, after the appendix is extirpated the focus is irrigated with ether, drains covered with gauze inserted and all covered with compresses of aseptic gauze fastened with American adhesive plaster. If there are no adhesions which isolate the focus, one of the drains should pass into the retrovesical space and the other along the ascending colon on its external side to the subhepatic space. In the absence of peritonitis the abdomen is completely closed by four layers of sutures: (1) one layer is continuous with the peritoneum, (2) one or two separate sutures bring together the fibers of the internal oblique and transverse, (3) one layer is continuous with the aponeurosis of the external oblique, and (4) Michel's clamps are used for the skin. Catgut is used for all ligatures and sutures except those of the skin.

The patient is put in bed and the nurse stays with him for 3 hours. If he is quiet with good pulse and normal temperature nothing is done

except to give small doses of fresh water to mitigate his thirst, increasing the amounts progressively to maintain diuresis. At the end of the second day, sweetened tea is given and from the third day liquid diet. On the fourth day a purgative is given and on the seventh day the clamps are removed.

The vomiting caused by the anæsthetic stops spontaneously when the intoxication is slight, but if it is extreme insulin in progressive doses should be given and if the stomach is full of liquid which has flowed back from the duodenum it should be emptied with a tube and washed. Intoxication followed by extensive fatty degeneration of the liver is beyond medical aid.

Rapid pulse with decreased tension, when it is due to lack of water because of repeated vomiting or copious sweating, yields promptly to the giving of liquids by mouth, by the Murphy method, or intravenously. Rapid pulse caused by myocarditis can be cured only by remedies capable of overcoming the infection and intoxication which have caused it (colloids, vaccines, serums, etc.).

In case of painful meteorism, an evacuating rectal tube may be introduced, or the ice bag and pituitrin may be used. We should never be in a hurry to open the abdomen when, soon after an operation for appendicitis complicated with peritonitis, signs of occlusion manifest themselves for these, being the result of intestinal paralysis caused by the inflammation usually recede with the latter and another operation under these circumstances is almost always fatal. If the surgeon is obliged to operate while such symptoms are serious, operation should be limited to fixing and opening a dilated loop of intestine under local infiltration anesthesia. If the patient is then given disintoxicating treatment a more serious operation may be avoided.

Operation is also contra indicated when a fecal fistula develops on the second to sixth day, because ordinarily the fistula closes spontaneously and so only rarely requires late operation.

SUMMARY

Operation in appendicitis presents no dangers which are inherent in the operation itself. Resources are available which make it perfectly safe. The seriousness of its complications have materially decreased with the latest discoveries in anaesthesia and therapeutics.

THE EARLY DIAGNOSIS OF ANENCEPHALUS

BY JAMES T. CASE, M.D., F.A.C.S., BATTLE CREEK, MICHIGAN

Surg. to the Battle Creek Sanitarium and Director of the Roentgen Department, Professor of Roentgenology, Northwestern University Medical School

AND

JOHN FLBERT COOPER, M.D., F.A.C.S., BATTLE CREEK, MICHIGAN

Obstetrician to the Battle Creek Sanitarium

EVEN before the onset of labor the careful obstetrician will suspect the presence of a fetal monstrosity when there are deviations from the normal findings on physical examination of the expectant mother. Nevertheless the actual definite diagnosis of the fetal abnormality before birth has rarely been accomplished even since the introduction of the X-ray into medical diagnostics.

The rounded shape of the normal fetal head is conspicuously absent in anencephaly although the roentgen films may show distinctly the spinal bones, the ribs, and the bones of the face and base of the skull. In 1916 one of us (4) reported a case successfully diagnosed as an anencephalic before birth, the conclusion being based upon the roentgen appearances. He at that time believed this to be a unique case for a careful search of the literature failed to disclose a report of a similar instance and in the 10 years which have passed since that report no others antedating this case have been found by the few writers who have touched upon this subject.

It is a matter of some satisfaction to us that we are now permitted to bring before the same society which heard our first communication, a report on our further experience in the diagnosis of this particular fetal monstrosity. We now have 5 additional cases of anencephalus to report, 3 of which were successfully recognized before the onset of labor and the diagnosis in each verified by roentgen examination. These together with the case reported in 1916 bring our total of cases successfully diagnosed before the onset of labor to 4, the roentgenograms of which will be presented in slides. In the other 2 cases the patients were brought into the hospital late in labor and there was no opportunity for careful study. These five cases were encountered among the 162 obstetrical patients handled by the maternity department of the Battle Creek Sanitarium during the last 10 years. Excepting the 2 patients who were brought in late in labor there has been no undiagnosed case of anencephalus in our clinic since 1915. In 4 cases successfully diagnosed (including the 1 published in 1916) the abnormal condition has

been recognized before the onset of labor and the delivery brought about prematurely on the strength of the prenatal findings. All 4 cases were sent to the roentgen department to determine why it seemed impossible to make out the fetal head or to determine the life or death of the fetus.

CASE 1 (1916) in para. The first 2 births had been normal in every respect, and the early months of the present pregnancy had been uneventful. Fetal movements were felt at the usual time, but the attending physician was unable to make out the fetal heart sounds. The placental sounds were loud and the amniotic fluid seemed excessive. It was thought that these two factors might have prevented detection of the fetal heart sounds. Another month passed yet in spite of prolonged and repeated efforts no fetal heart sounds could be detected. The abdomen was as large as one would expect at term. The fetal movements, which had been felt normally for several weeks, disappeared the patient attributing the disappearance of movements to a fall.

On external examination it was difficult to make up one's mind whether there was a head or breech presentation. On vaginal examination one palpated what seemed to be the breech. Fetal heart sounds and movements continued absent. X-ray examination to determine the position of the fetus and to explain the absence of movement was suggested. The outline of the fetus in the roentgenogram proved to be much smaller than one would expect considering the size of the abdomen. Although the bones about the face and the base of the skull, the spinal bones, the pelvic and long bones were all very distinct in fact unusually prominent the cranial bones were notable by their absence.

The diagnosis was anencephalus, hydramnios, death of fetus. The diagnosis of death of fetus was based upon the persistent absence of fetal heart sounds, cessation of fetal movements, cessation of growth as determined by external measurements and by comparison of roentgenograms increased density of the fetal bones. In this case milk had never appeared in the breasts at any time. Repeated tests of the urine and blood failed to show any abnormal findings. At operation the hydramnios was verified and a macerated but anencephalic fetus was extracted. This patient has borne several healthy children since.

CASE 2 (1924) in para. The patient had had 2 miscarriages, one at 4 weeks and one at 10 weeks and had no living children. The Wassermann reaction was negative. The patient presented herself May 14, 1924 for obstetrical examination at about the eighth month. She felt fairly well except for pyrosis and occasional low abdominal pain. The fetal heart sounds were not definitely heard but were thought to be present. The head was not present. Breech presentation was suspected but the head was not satisfactorily made out. She was referred to the X-ray department for examination because the presentation could not be determined and the amniotic fluid was excessive. The



Fig 1 A typical case of anencephaly Lateral roentgenogram

abdomen was very large for the duration of the pregnancy. Hydramnios was evident. Roentgen examination showed the skeletal outlines of the fetus to be complete except for the cranial bones. The bones of the face and base of skull were made out but the cranial vault was conspicuously absent. The diagnosis was anencephalic monstrosity, hydramnios, cephalic presentation. Three days later the patient was delivered of an anencephalus with complete spina bifida.

CASE 3 (1924) in para. The patient presented herself for obstetrical examination on April 20, 1924. She had 2 normal children, both deliveries had been normal. Apparently there was now a cephalic presentation. Fetal heart sounds could be heard on the left below the umbilicus. On re-examination May 19, it was thought that the head was high in the right side. The uterus appeared to be of unusual size, indicating hydramnios. The patient complained of pain in the lower abdomen. On account of difference in previous findings a re-examination was made on June 2. Fetal heart tones were normal. The uterine fundus pressed tightly against the emiform process. The head was not palpable. It was decidedly a case of hydramnios. The case was referred for X-ray study for further information. Roentgen findings. Examination showed a fetal abnormality, anencephalus, hydramnios, cephalic presentation, no engagement. The uterus was emptied of anencephalus and the diagnosis of hydramnios confirmed.

CASE 4 (1925) in para. Obstetrical examination at about the third month showed no abnormalities. There was nothing unusual about the case until November 3, when upon examination the uterus seemed to be of a size indicating full term, although from her history it appeared that she was only 7 months pregnant. She complained of lower abdominal pains suggesting labor contractions. The head could not be palpated, although fetal heart sounds were audible on the left side. Vaginal examination disclosed a



Fig 2 Anencephalic fetus of 7 months

slight dilatation of the cervix through which it was possible to feel what were the rough edges of a fetal head abnormality. It was sent to the roentgen department with a view to anencephaly. Roentgen examination showed presentation of an anencephalic monster. Premature delivery was brought about by the acranial fetus.

THE DIAGNOSIS OF ANENCEPHALOS

Negri (9) in 1889 laid down the signs of anencephaly on the basis of which he suspected the diagnosis. By careful palpation the faulty cranium was recognized and there were movements of the presenting part. In one case the fetus was dead before delivery.

Viana (13) reports 2 cases. In the first, hydramnios, it was possible to perceive movements of the presenting part. In the second, the fetus was palpable alone, and he made a probable diagnosis.



Fig 3 Roentgenogram of fetus shown in Figure 2 The spina bifida was recognized from the roentgenogram

which was later verified. In the second case, in the eighth month a diagnosis was made of a probable morphological alteration of the fetal head. Pregnancy was interrupted and a 1400 gram anencephalous fetus removed.

Lautaigne (8) in 1883 gave the signs for diagnosis of anencephaly as follows: Considerable volume of abdomen; tension of uterus; hydramnios; exaggerated spasmodic movements of fetus (exaggerated as regards intensity, situation and coordination in relation to normal fetal movements).

Lautaigne quotes Pinard's rule: (1) Permanent exaggerated tension of uterus; (2) difficulty in finding fetal poles; (3) difficulty in identifying fetal head; (4) convulsive movements of fetus. In addition, Lautaigne suggests an auscultatory sign, viz., weak fetal heart sounds. He also suggests that by the examining finger it is possible to determine easy and exaggerated 'ballotement' and to feel presentation anomalies (see our Case 4).

Lascano (7) recognized *intra vitam* a case of anencephaly from the physical exploration through the cervix alone. The case was verified. Thoms (12) and Ballard (2) each report a case of anen-



Fig 4 Anteroposterior study of Case 3

cephaly diagnosed *intra vitam* at the beginning of labor from the physical findings of the examining finger *per vaginam*. The diagnosis was verified in both instances.

Giglio (6) refers to some of the characteristics of these monsters which may lead to certain diagnosis not only in pregnancy but in labor. His signs of probable anencephaly are: The existence of polydramnios, serous infiltration of the subcutaneous tissue or the anasarca aspect of the patient; thickening of the skin on the mons veneris and vicinity; presence and fugitiveness of traces of albumin in the urine; disordered fetal movements, syphilitic history, etc.

The most favorable time for the physical diagnosis of anencephaly is at the beginning of labor. By digital exploration and digital touching of the presenting part, the form and volume may sometimes permit recognition of an anencephalus when the cephalic extremity presents. The diagnosis becomes easier as dilatation proceeds. Suggestive signs are smallness of the presenting head, absolute absence of the cranial aspect and the fact that at a certain degree of uterine dilatation the descent of the cephalic extremity into the birth canal occurs.

Giglio also discusses abnormality of the fetal heart sound. This is always weak and uncertain, he says, because the cardiac muscle, although apparently physiologically formed and sufficiently

nourished, as lacking in innervation for its function because the cerebral and even spinal centers may not be developed

VALUE OF THE ROENTGEN EXAMINATION

The foregoing brief summary includes all the physical signs which have been offered upon which to base a diagnosis of anencephalus, yet, most of them are indecisive except after the stage when the onset of labor permits the introduction of an examining finger into the cervical canal. It is a pity to permit the mother of an anencephalous monster to carry the fetus after it has become possible to make a definite diagnosis, yet toward this object the physical signs available before the onset of labor permit only a conjecture, at the best.

Now that the obstetrician may utilize the roentgen rays in his work, without any fear of doing damage to either mother or child, it seems reasonable to invoke this aid in every case in which any doubt exists as to the location or normality of the fetal head. Anencephalic monsters are usually associated with more or less deviation from the normal course of pregnancy. It is with some pride that the authors relate these 4 cases recognized positively before the onset of labor and point to the fact that in the last 11 years, in a series of nearly two thousand consecutive labors, the only cases of anencephaly which have not been recognized before the onset of labor were 2 brought into the hospital and seen for the first time long after labor had commenced.

Technique of the roentgen examination. Films may be exposed with the patient lying on the side and lying prone upon the film. In the latter instance, it is a simple matter to place pillows under the hips and chest in order to prevent undue pressure upon the distended abdomen. Intensifying screens are invariably employed to reduce the time of the exposure. The results are much more satisfactory now that the diaphragm first conceived by Bucky but not at all practicable, has been perfected by Potter of Chicago. By the employment of fine focus tubes, double intensifying screens with films, and the Potter Bucky diaphragm, excellent roentgenograms are easily obtainable, even with a bedside X ray equipment.

Interpretation of roentgen findings. The abnormal development of the base of the skull with small orbital cavities, absence of sella turcica, absence of cranial bones, and more or less extensive spina bifida afford opportunity for prenatal recognition of anencephalus in the roentgenogram. Normally the rounded outline of the cranial vault is the most conspicuous part of the unborn fetus



FIG. 5 Anteroposterior study of Case 4

on the roentgen film in anencephaly the bones of the face and base of the skull cast a shadow rather more dense than usual, the rounded outline of the cranial bones being conspicuously missing. In one of our cases a spina bifida was plainly seen, though the first in the literature to make mention of this finding is Doub (5). In reviewing our cases, we are able now to recognize the spina bifida in the roentgenograms of another of our cases. In the future this should be one of the objectives to be attained in the roentgen study of these cases.

The first case of anencephaly recognized roentgenologically before the onset of labor was reported by Case (4) in 1917, in a paper read in 1916 before this society. Since that time there have been an increasing number of reports of this condition. Campbell and Willetts (3) in discussing the value of the X ray in obstetrics cite a case of anencephaly recognized before the onset of labor. Menees was associated with the authors in their work. Spangler (11) reported 2 cases successfully diagnosed before labor set in, with the result that pregnancy was terminated early and the mother spared the many trials of continuing pregnancy and the chagrin of delivering a monster at term. Anderson (1), co-operating with Menees, reports 2 cases in which anencephaly was roentgenologically proved before the onset of labor. In one of these patients there were twins and it was recognized that one of them was anencephalous. The other twin was born alive and is in good health.

Even after the onset of labor there may be a use for the X ray examination, as shown by the case of Rudolph (10).

SUMMARY

1 Four cases are reported in which the diagnosis of anencephaly was made before the beginning of labor. In each case the diagnosis was based upon atypical physical findings plus the proof furnished by the roentgenogram and verified by operation.

2 These four instances represent all the cases of anencephalus which entered this clinic prior to the onset of labor (since 1915). Two other patients who were not seen until labor was well advanced were found with anencephaly, but the diagnosis was already evident from the appearance of the presenting deformed head when the patients were first seen.

3 A brief review of the literature shows that without the roentgen examination it is possible to do no more than conjecture the presence of anencephaly. It is therefore reasonable to urge a routine roentgen study of all obstetrical cases presenting hydramnios when there is difficulty in identification of the fetal poles or when the fetal heart sounds are weak or uncertain. With the aid of the X ray it is possible to state definitely whether or not there exists an anencephalus.

4 There is given a brief review of the cases of anencephaly thus far reported in the literature successfully recognized before the onset of labor.

5 Anencephaly represents only a relatively small proportion of fetal monstrosities and the monstrosities represent only a small part of the field of usefulness of the roentgen ray in obstetrical practice.

REFERENCES

- 1 ANDERSON F B. *Am J Obst & Gynec* 1925 iv 397
- 2 BALLARD J. *de med de Bordeaux* 1920 xci 150
- 3 CAMPBELL and WILLETS. The diagnostic value of the X ray in Obstetrics. *J Michigan State M Soc* 1933 xxxi 465
- 4 CASE JAMES T. Anencephaly successfully diagnosed before birth. *Sur., Gynec & Obst* 1917 xxv 12
- 5 DOTY H P. *Am J Roentgenol* 1923 xiv 39
- 6 GIGLIO. Mostri anencefali e derencefali. Diagnosi in gravidanza e in travaglio di parto. *Atti d Soc ital di ostet e ginec* 1896 iii 83
- 7 LASCANO. *Semana méd* Buenos Aires 1923 i 429
- 8 LAUTAGNE. *Ann de gynéc de Par* 1883 xiv 401
- 9 NEGRI. Per la diagnosi delle mostrii ita fetali durante la gravidanza e nel parto. *Riv veneta di sc med* 1889. Quoted by Viana
- 10 RUDOLPH L. Roentgenographic diagnosis of anencephaly. *Am J Obst & Gynec* 1915 v 840
- 11 SPANGLER D. The value of the roentgen ray in the diagnosis of atypical pregnancies with report of two cases of anencephaly diagnosed before birth. *Am J Roentgenol* 1924 xi 235
- 12 THOMAS J. *Am M As* 1918 lxx 10
- 13 VIANA. Un segno importante nella diagnosi di anencefali. *Rassegna di ostet e ginec* 1905 xiv 393

DISCUSSION

DR W C DANFORTH. Dr Case has given us an interesting and practical exposition of the subject. The X ray can be a very valuable aid in the diagnosis of anencephalus. A patient recently came under my care at 7 months because of a rapid increase in the size of the uterus. She had an acute hydramnios which caused me to suspect the possibility of an abnormality of the fetus. X ray plates showed very clearly the absence of the cranial vault. I have brought the plates with me for your inspection. Labor was induced and an anencephalic fetus delivered. Three or four years ago this same patient was under the care of another member of this society for a similar condition. Diagnosis at that time was also made by X ray.

DR CARL H DAVIS. Milwaukee. Since locating in Milwaukee I have delivered two patients of anencephalic monsters. In one there was some question as to whether she had an anencephalic monster or a placenta ahead of the head. The X ray showed it was an anencephalic monster.

This brings up a very important point, namely, in cases of breech presentation in which cesarean section may be considered it is well to take an X ray to determine whether the head is normal before going ahead with the operation. Out of six anencephalic monsters which I have delivered four have presented by the breech.

DR C S BACON. The importance of determining the presence of anencephalic monsters in pregnancy comes up particularly when we have to decide whether in the presence of hydramnios the fetus is normal or not, because in the first case we wish to carry on the pregnancy in spite of the discomfort to the patient, whereas in the case of a monster it is a loss of time to say the least and a great deal of discomfort to the patient to have her go on to term. I recall one patient over 30 years old who was extremely anxious for a child. Along about the twenty-sixth week of her pregnancy she became distended and suffered considerably. There were uterine contractions and on account of her great anxiety for a baby I kept her under drugs to a certain extent to control the contractions of the uterus. I continued the treatment for several weeks until finally she was delivered of a monster. The next time she became pregnant she went through the same history except that I did not keep her in bed so long and she was delivered the second time of an anencephalic monster. Then in spite of my advice that she should give up trying to have a family, she became pregnant a third time and was delivered of a monster.

The point I want to make is that this procedure advocated by Dr Case is of a good deal of importance in the differential diagnosis between hydramnios from whatever cause it may be with a fairly normal child and a monster.

DR IRVING I STEIN. I think a word of warning should be sounded on the interpretation of the film in the diagnosis of an anencephalic monster and hydramnios. Much depends upon the position in

which the patient is placed when the film is taken. We have many instances where pictures taken in the lateral, dorsal and prone positions do not visualize the skull bones. In the presence of hydrocephalus when the fetus is difficult to portray, it is hard to make a differentiation between a normal and an abnormal fetus. We have hesitated very much about being too dogmatic in the interpretation of the films of suspected monsters. In one instance we thought from the pictures taken in the lateral and dorsal positions that the fetus had hydrocephalus but later the patient was delivered of a normal baby with a normal head. Again in a case of breech or dorsal view the skull bones were not visible on the film and we suspected an anencephalus. However upon obtaining a film in the prone posture the head was visualized and appeared normal.

Dr N S HEAFY At the time of Dr Case's first paper before this Society I reported also a case of anencephalus which though not diagnosed in full detail was nevertheless definitely determined to have a marked deformity of the head. This patient had a marked hydrocephalus and upon the basis of the X-ray examination the treatment to prevent premature labor was stopped and the patient promptly went into labor and gave birth to the monster.

I was interested in hearing about the case of spina bifida of Dr Case because I did an elective cesarean section this last year and was chagrined to deliver a child with a spina bifida in the cervical region. In every case of elective cesarean section we have a preliminary X-ray examination to rule out possible monstrosities. We were not able to find anything the matter with this child's skeleton and were unprepared for a child with spina bifida. Perhaps the deformity is not great enough to show by the means we have yet at hand.

Recently we had a patient under attention whom we did not wish to go past term. Examination made preliminary to a proposed induction of labor showed a very small presenting head not larger than would be expected in a 6 or 7 months fetus. X-ray examination showed that the skull was perfect in outline but extremely small while the rest of the skeleton was of normal appearance. We had not met this appearance on the X-ray plate before and were not certain enough to make an absolute diagnosis but suspected

that we were dealing with a fetus with anencephalus. The patient was allowed to go into labor spontaneously and the fetus was one in which the brain lay outside of the cranial cavity.

Dr JOHN E COOPER Battle Creek Michigan The main diagnostic feature of these cases is the polyhydramnios. The polyhydramnios develops in almost all cases within 2 or 3 weeks. In the cases in which the condition comes on quickly and ballottement is present we feel that we are dealing with an abnormality of the fetus and have an X-ray examination made. It usually occurs in the seventh month or following that. By ballottement of the fetus we mean a too free movement of the whole fetus in the abdomen.

Dr J T CASE Battle Creek (closing) I remember very well that 10 years ago when I reported the first case of anencephaly discovered by the X-rays before the onset of labor Dr DeLee mentioned that the history of these patients was important for he had observed that anencephalus tended to repeat. That is why I mentioned in the notes of my first case that the patient had since the birth of the anencephalus given birth to two normal children.

Dr Bacon's case is especially interesting in this connection.

All five of our cases were cephalic presentations. The chance of error in interpretation referred to by Dr Stein is important. Only today I learned of a case here in Chicago in which the patient had been suspected of having an anencephalus, this opinion being based upon the anteroposterior radiological examination. Further confirmation was desired however and a lateral roentgenogram was made showing a perfectly normal cranial vault. This is a very important warning and one which we should bear in mind.

Of course the field of roentgenology in obstetrics is very broad. I have been particularly interested in the last 2 or 3 years in hearing about the development of an obstetrical roentgenological center in Paris. They have taken a great deal of interest in it and have accomplished a great deal. They naturally take the viewpoint that the radiologist must be an obstetrician in order to appreciate what they are trying to find. No doubt they will work out some thing valuable.

EXPLORATION OF THE CEREBELLUM

By E B TOWNE M D SAN FRANCISCO

From the Department of Surgery Stanford University Medical School

THE operation of cerebellar exploration has undergone a gradual evolution in this clinic during the past six years. The earlier technique was that of Cushing¹ in which we used general anaesthesia and the cross bow incision. At the present time the operation is done with local anaesthesia through a long midline incision. In a few recent cases a gliomatous cyst has been tapped through a small trephine opening and exploration has been postponed until the patient has made the maximum improvement resulting from relief of the internal hydrocephalus. The present technique lessens hemorrhage and intracranial pressure shortens the period of convalescence restores the neck to a normal condition and decreases the operative risk.

Anaesthesia. Procaine adrenin anaesthesia has been used since 1919 for all operations on the brain unless contra indicated by the age or the mentality of the patient. It reduces to a mini-

imum two major difficulties of intracranial surgery, hemorrhage and the increased cerebral pressure of etherization. The shock of such operations is practically eliminated. The patient's cardiac rate and blood pressure show little if any change during operation. There is rarely any postoperative vomiting. Operating on a conscious patient certainly imposes an increased strain on the surgeon but the fact that an operator who once tries local rarely goes back to general anaesthesia for intracranial work is the best evidence that it is worth while.

Infiltration of the extracranial soft parts is satisfactory for operations on the cerebrum but not for exploration of the cerebellum, because the large posterior cervical muscles require so much solution. Direct blocking of the upper cervical nerves is a better method. The lateral oblique route described by Meeker and Hundling² has proved to be the best, as it eliminates the danger of injury of the vertebral vessels or of puncture of the dura. It gives an anaesthesia limited above by the distribution of the fifth cranial nerve and it may be carried downward as far as is desirable. For the incision described below injection on the transverse processes down to and including the fifth cervical is sufficient. About 3 ounces of 1 per cent procaine containing not more than 20 drops of adrenin are required.

Incision. Cushing's cross bow incision gives a perfect exposure of both cerebellar hemispheres. The only objection to it is the necessity of immobilizing the patient's head for 10 days, in order to be sure that the cut muscles heal soundly. The incision to be described has been used for some time by Dr H C Naffziger of San Francisco. It extends from a point 4 inches above the external occipital protuberance to the tip of the fourth cervical spinous process keeping strictly in the midline. The scalp is freed laterally from the epicranial aponeurosis and from the fascia of the cervical muscles for a distance of 2 or 3 inches. The muscles are detached from the laminae of the upper cervical vertebrae and from the occipital bone up to the superior curved line and as far as the mastoid process. By proper retraction and change of the position of the head, the craniotomy, the incision of the



Fig 1 Photograph of the scar of the midline incision

dura, and the intradural work can be carried out as easily as through the cross bow incision. An excellent exposure of the cerebellopontile angle is obtained. More room may be gained by short transverse incisions in the fascia, but this step has never been necessary. As no muscle fibers are cut across, immobilization of the neck is not required. The postoperative period is therefore more comfortable, and the wounds are invariably strong.

The following case illustrates the value of the anesthesia and of the incision.

W. McG., a man aged 32 years, was seen in July 1925 complaining of headache, dizziness, loss of visual acuity, double vision, vomiting and loss of 40 pounds in weight. Examination showed high grade choking of the optic disks, nystagmus, an unsteady gait deviating to the left, ataxia, more marked in the right arm and leg, and slight central type weakness of the left face. August 5 the upper cervical nerves were blocked with 90 cubic centimeters of 1 per cent procaine containing 15 drops of adrenalin. The cerebellar hemispheres were exposed after tapping the posterior horn of the right lateral ventricle. The right hemisphere was larger and softer than the left. A blunt aspirating cannula entered a cyst 1 centimeter below the surface of the right hemisphere and evacuated 30 cubic centimeters of yellow fluid which coagulated at once. At the end of operation the patient's cardiac rate was 90 per minute and his blood pressure had dropped only five points. He made an excellent recovery. Figure 1 shows the scar. In November 1925 he had gained 30 pounds in weight and was free from symptoms except for occasional attacks of dizziness. Examination showed nothing abnormal except slight nystagmus on looking to the right. The optic discs and the visual acuity were normal. The facial weakness was gone. There was no headache or ataxia, and the gait was normal.

Preliminary evacuation of a cyst. The advantages of this procedure are illustrated by the following case, in which it was first used as the result of a mistaken diagnosis of abscess of the brain.

C. L., a schoolboy aged 12 years, referred by Dr. Constantine Bricca of San Francisco, was seen in October 1924 complaining of headache, dizziness, double vision, and vomiting. In 1910 he had a pulmonary abscess followed by pyemia. Examination showed choked discs measuring 7 diopters, weakness of the left sixth nerve, central type weakness of the left face, slight weakness of the right arm and leg, and increased tendon reflexes and pathological great toe signs on the right. There was no nystagmus, ataxia or dysmetria. He was too prostrated to attempt to stand. He was flushed, drowsy and often irrational. There was a positive Kernig sign, more marked on the right side. The temperature was normal, the cardiac rate 70 and the leucocytic count 15,000. The ears and nasal sinuses showed no evidence of infection. The preliminary diagnosis was a lesion of the left frontal lobe, possibly an abscess. October 24, under general anesthesia, the left frontal lobe was explored with a blunt aspirating

cannula through a small trephine opening. The cannula entered a dilated ventricle at a depth of 2.5 centimeters. The diagnosis was changed to a lesion of the right cerebellar hemisphere, possibly an abscess causing an internal hydrocephalus. October 29 the right cerebellar hemisphere was explored through a trephine opening in the angle between the mastoid process and the lateral sinus. At a depth of 3 centimeters the cannula entered a glommatous cyst and evacuated 25 cubic centimeters of yellow fluid which coagulated immediately. The symptoms and signs of internal hydrocephalus cleared up rapidly. When he left the hospital November 21, the swelling of the optic discs measured less than 2 diopters and he was walking steadily on a rather wide base. He gained rapidly in weight and strength. December 29 he was beginning to complain of headache and to vomit occasionally. The optic discs showed a slight recurrence of swelling after having been practically normal for 2 weeks. January 7 and 12, 1925, under general anesthesia, a two stage exploration of the cerebellum was done through a midline incision. The tumor involved the middle and right lobes. The presenting wall was 1 centimeter in thickness. The diameter of the cystic cavity was about 4 centimeters. Microscopic examination of the excised posterior wall of the tumor showed degenerating glioma. The patient made a good recovery and left hospital February 8. Roentgen ray treatments were given once a month up to June. At the present time, December 1925, the boy appears to be entirely normal without any demonstrable sign of cerebellar disease. He plays actively and does well in school.²

This experience brought up the question of deliberately using this procedure in certain selected cases of cerebellar tumor. Martin³ has analyzed Dr. Cushing's material, consisting of 95 verified cystic gliomata and glommatous cysts, representing 30 per cent of the gliomata in his series. Fifty-four and seven tenths per cent of the "glomes cavitaires" were in the cerebellum. If one eliminates tumors of the cerebellopontile angle, which are usually localized without difficulty, there is a good chance that other tumors of the cerebellum may be cystic. If, in such a case, the patient's condition is precarious because of advanced internal hydrocephalus, preliminary aspiration may be carried out with little or no risk and with a reasonable prospect of relieving internal hydrocephalus and decreasing the risk of the subsequent major operation. It has happened that cysts were found in both the other patients on whom a preliminary cannula exploration was done. In both instances the patient came to exploratory operation in vastly improved condition.

Elisberg⁴ has recently proposed the same procedure for tumors of the cerebrum, "with the hope and belief that it will materially diminish the number of useless major operations for supra-

¹Both patients W. McG. and C. L. were well in June 1926.

²Martin, Paul. Le traitement chirurgical des glomes cavitaires de l'encéphale. Arch. Franco Belges de chir. 1925, xvi, 807.

³Elisberg, Charles A. Problems in the diagnosis and treatment of intracranial tumors of the cerebral hemispheres with remarks on a new surgical procedure. Am. J. M. Sc. 1925, clxx, 324.

⁴Since this article was written a successful intracranial evacuation of an eighth nerve tumor has been done with local anesthesia. Although the exposure through the midline incision was satisfactory, the tumor lay so deep that it was found best to cut the fascia and muscle on one side to a point halfway between midline and mastoid process.

tentorial new growths, and that by this means the indications for operative interference will not only become more clearly defined but also that the results of the surgery of tumors of the brain will be improved by the exclusion of surgically hopeless intracranial disease." Dr Elsberg says nothing about cerebellar tumors. In this clinic cannula exploration through a small trephine hole is restricted to infratentorial lesions unless the presence of an abscess cannot be ruled out, in which case the cerebrum is similarly explored. If a cerebral lesion is certainly a tumor and if the history and findings suggest a glioma, we do a subtemporal decompression and evacuate a cyst if one is found through this opening. If the presence of a glioma is not proved or if an enucleable tumor is found, an osteoplastic flap operation is done after an interval of time. With glioma verified roentgen ray treatment is started. Cases 1, 2 and 5 of a recent report¹ are examples in point. This method avoids useless osteoplastic explorations and provides the necessary decompression. Our aim in using cannula exploration through a small trephine opening is therefore quite different from Dr Elsberg's, in that we

hope to evacuate a cerebellar cyst and temporarily relieve the pressure on the aqueduct of Sylvius which has produced an internal hydrocephalus.

SUMMARY

In the development of the technique of exploration of the cerebellum, three procedures have proved to be of value.

1. The use of local rather than general anesthesia has lessened the operative risk by reducing hemorrhage and intracranial pressure. Blocking of the upper cervical nerves by the superior oblique route of Meeker and Hundling is the best method.

2. Replacement of the cross bow incision by a midline incision has eliminated bulky dressings, increased the patient's comfort, shortened the period of convalescence, and given uniformly strong scars.

3. Temporary relief of internal hydrocephalus by aspiration of fluid from a gliomatous cyst of the cerebellum through a small trephine opening has in a few selected cases, greatly improved the patient's condition and made him a better surgical risk for the exploratory operation postponed until the appearance of the first signs of recurrence of the hydrocephalus.

¹ Tom E B. Roentgen ray treatment of tumors of the brain. J Am
M A 9 5 1 3 3

A FLEXIBLE-KNEE TRACTION SPLINT FOR THE LOWER LIMB

By KENELM H DIGBY M.B. B.S. F.R.C.S. HONGKONG, CHINA
Ho Tun, Professor of Clinical Surgery and Professor of Surgery University of Hongkong

SO many types of splints have been recorded for the treatment of fractures of the shaft of the femur that one hesitates to describe another. But the very number of methods adopted suggests that the ideal piece of apparatus has not, so far, been devised. This paper describes a splint which embodies certain modifications which seem to be of advantage.

There is no doubt that the general practitioner who undertakes the treatment of a fractured femur does so with considerable anxiety. Of course it is easy to say that all fractures of the femur should be treated in hospitals or even in special femur hospitals with elaborate apparatus and care. But often enough this is impracticable. It can also be said that a fractured femur should be treated by open operation and the fragments accurately fixed with plates and screws. But the operation is a severe one and not advisable in all cases. And perfect as the results are, yet it is doubtful whether an operation not entirely free from risk should be undertaken if good length and alignment can be secured by conservative measures. Indeed we would advise an open operation only when the condition is not satisfactory after at least one week of conservative treatment. Moreover the very special skill required for plating fractures aseptically is not always at hand.

The principal excuse for describing the present splint, then, is that it provides a simple and very comfortable apparatus ready for use, which secures results as good as those obtained by more complicated apparatus for conservative treatment in special hospitals with specially trained staffs.

PRINCIPLES EMBODIED IN THE SPLINT

A flexible joint for the leg piece. One cause of delayed recovery after fracture of the shaft of the femur is knee stiffness. During the Great War it was found that by attaching a hinged leg piece to Thomas's splint (the Thomas splint being suspended and pulled on by weights on the Hodgen principle) the knee could be flexed and extended daily and the stiffness of the knee could be avoided. Pearson used this method in association with his non penetrating ice tong calipers with great success.

If this flexible leg piece is employed with the usual adhesive strapping applied to the leg in

stead of Pearson's ice tong calipers it soon becomes apparent that as the degree of flexion approaches a right angle the adhesive strapping becomes loose and all the traction force comes to be borne directly on the back of the calf at right angles to the surface (Fig. 1).

In the splint about to be described we take advantage of the idea of applying traction¹ by pressure on the back of the calf as well as by (or alternately to) friction on the skin surface by adhesive strapping. The splint can however be used conveniently in association with direct skeletal traction by ice tong calipers or transfixation pins if so desired, and is also extremely useful when the fragments of the femur have been plated at open operation.

The Hodgen type of frame with introduction of a telescopic principle. After extensive trials with various experimental apparatus we find the Hodgen type of frame preferable to the Thomas. The close encircling ring of the latter is liable to produce blisters even when a traction weight is employed. This is particularly true in a tropical climate, where also the padded Thomas ring is too hot and the padding is liable to become infected with vermin.

To prevent any pulling of the frame down from the hip as the limb lengthens we secure the upper end around the waist of the patient, who is sitting up, by webbing and a buckle covered with rubber tubing. And, in order that traction at the site of the fracture may not be interfered with, the telescopic principle is introduced.

A nearly horizontal position for the thigh. By keeping the thigh as nearly horizontal as possible, the weight used in maintaining traction is employed entirely to that end and not exerted in raising or supporting the lower limbs. One of the great difficulties in conservative treatment of fractures of the femur is the application of sufficient weight traction without damage to the tissues at the point of application. By employing the traction force to raise the limb as well as to exert pull in the long axis of the thigh, one is needlessly increasing this difficulty.

A footplate. With the thigh more or less horizontal and the leg nearly vertical it becomes nec-

¹The word traction is much better than the more commonly used extension which is liable to cause confusion with regard to the position of the adjacent joints.

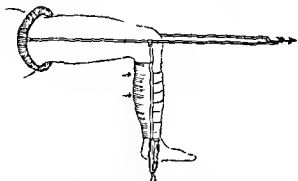


Fig 1 When the knee is forced to a right angle traction force in the long axis of a Thomas splint bears directly on the back of the calf

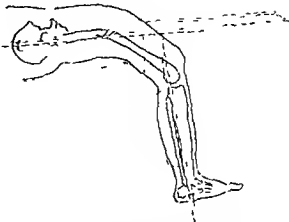


Fig 2 When the knee is flexed to a right angle the foot, leg and lower fragment of the femur sag downward. This illustrates the need for a foot plate

essary to provide a footplate. Otherwise in the case for instance of a fracture below the middle of the shaft of the femur the weight of the part of the thigh with the lower fragment of the leg and of the foot have all to be supported by the flannel thigh sling below the site of the fracture. This part of the flannel sling then tends to cut into the back of the thigh just above the bend of the knee. There is also a tendency to tilt the proximal end of the lower fragment forward (Fig 2).

A single point of suspension. By suspending the limb in a case of fracture of a long bone we aim at securing fixation of the fragments without absolutely checking movement of the proximal and distal joints. The frame supported limb must be so freely and so delicately balanced that the proximal end follows any excursion of the pelvis or any movement imparted to any part of the splint with practically no resistance. If the frame supported limb is suspended at more than one point, even if so suspended by equipoise weights, this is not fully obtained, for the pelvis may not only move up and down but also from side to side.

Even in the method here advocated, the attachment of the cord bearing the traction weight interferes slightly with the principle of a single suspending cord at the center of balance. But if the cord is accurately in the line of the splint frame and if there is a good length of cord between the end of the frame and the pulley, the defect is only a slight one.

After the use of plates and screws, no traction is needed and the ideal of a single point of suspension is completely realized.

A sitting up position for the patient. This is of enormous advantage in elderly people, in whom prolonged recumbency involves risk of lung

trouble and bedsores. Patients at all ages find the sitting posture pleasanter in the day time during the long period of inaction. The patient soon accommodates himself to sleeping in a sitting position. The use of the bed pan is greatly facilitated.

The best mean position for the adjacent joints. Some range of movement is aimed at in the adjacent hip and knee joints as very desirable. At the same time for each joint certain positions may be regarded as favorable, and these should be the average or mean positions occupied during healing.

There are several considerations to guide us in determining the best mean positions.

1. In order that the minimum traction weight may be employed, the maximum relaxation of the muscles must be secured. This is done by placing each joint at the mid point of the normal range of each of its movements.

The principal movement at the hip joint is about a transverse axis and has a range of some 160 degrees when the hamstrings are relaxed by flexion of the knee joint. The hip should be flexed from the so-called anatomical position through about 80 degrees. With the hip so flexed abduction is much freer than adduction; abduction can now take place to 80 degrees, adduction only to 10. Hence abduction to 35 degrees is the mid position giving the maximum relaxation. With hip flexed 80 degrees and abducted 35 degrees lateral rotation takes place through 35 and medial rotation takes place through 15 degrees.

Therefore the hip should be flexed 80 degrees, abducted 35 and laterally rotated 10.



Fig 3 Showing the muscles which are lacerated in a fracture of the shaft of the femur

The only movement at the knee joint that needs to be considered is that of flexion about a transverse axis through about 160 degrees

The "mean position" of the knee-joint is thus flexion through 80 degrees from the "anatomical position"

2 A second consideration is that to prevent subsequent stiffness of the adjacent joints, we must rather stretch those muscles which are especially bruised and lacerated at the time of the fracture. In the case of the femur the three vasti muscles suffer most damage, and next to them the adductor group (Fig 3). This is well seen in postmortem examinations of cases with recent fracture of the femur. The vasti muscles extend the knee joint. Hence we have an additional reason for flexing the knee joint. Indeed we should from this point of view feel inclined to increase the flexion beyond a right angle. When the femur is treated in an extended or only very slightly flexed position, the lacerated muscles cicatrize in that position with resulting contracture and stiffness of the knee. As they lie too far from the bone, the hamstrings which flex the knee are seldom lacerated, with the exception of the short head of the biceps. Moreover the vasti muscles enwrap the shaft of the femur and if taut play a useful part in holding the parts in apposition.

The adductor muscles adduct and laterally rotate the hip-joint. We are therefore encouraged to adduct the hip joint from the anatomical position, but from this point of view slight medial is preferable to lateral rotation.

3 When the fracture is near either extremity of the femur the generally recognized principle

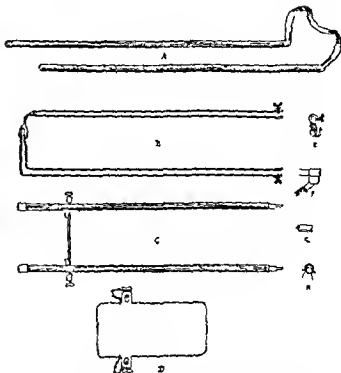


Fig 4 Diagram of the parts of the flexible knee traction splint ($< \frac{1}{4}$) A, Thigh piece B fixed leg piece C movable parts D foot plate E hinge in section F, hinge from side G clip H, clip in section holding flannel

must be observed that the longer fragment must be brought into alignment with the smaller and less controllable one.

If the fracture of the femur is immediately below the greater trochanter the upper short fragment receives the insertion of flexors but not of extensors of the hip-joint and all the abductors and medial rotators and only some of their antagonists. Hence the upper fragment is flexed, abducted, and medially rotated to a slight degree and the lower fragment with the whole limb must be brought into line with it.

On the other hand if the fracture is so low as to lie immediately above the origin of the gastrocnemius the lower fragment has flexors of the knee-joint but not extensors attached to it and therefore assumes a position of very considerable flexion. The knee may therefore then require to be flexed to more than a right angle to restore the correct alignment.

Fortunately the considerations named point for the most part in the same direction.

The hip and knee are each flexed nearly to a right angle and the hip is abducted 35 degrees.

If the fracture is very high up the flexion and the abduction of the hip joint should be augmented to a certain extent, and if the fracture is very low down the flexion of the knee joint should be increased.

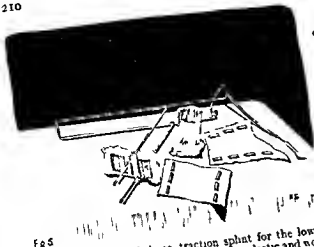


Fig 5 The flexible knee traction splint for the lower limb showing wool over the foot plate, poroplastic and wool for the calf and flannels and clips for the leg and thigh also waist webbing enclosed in rubber tubing

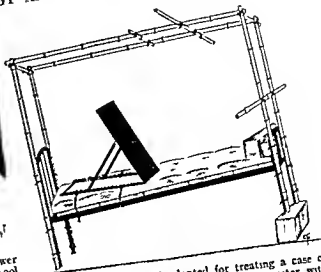


Fig 6 Ordinary bed adapted for treating a case of fractured femur showing the bamboo four poster with three cross poles, the foot rest, the obliquely placed back rest, the raised foot of the bed and the fracture boards beneath the mattress

With regard to rotation it is probably best to adhere to the anatomical position and it may be pointed out that with this splint the anatomical position is secured when the leg is placed vertically.

Adjustability The splint should be easily adjustable so that it will accurately fit either right or left lower limb at almost any age. This feature is especially valuable to the small hospital and to the general practitioner in outlying districts who may have to treat fracture patients in their own homes. The splint to be described now has been fitted to a boy of 8 years and to a man of 6 feet 2 inches in height.

Non-slipping of supporting flannels Owing to the fine longitudinal grooves on the rods of the splints the metal clips hold the flannel supports of thigh and leg so securely that there is absolutely no slipping through of the flannel. If any such give were to take place the splint would soon cease to be properly adjusted.

SPECIFICATIONS OF THE SPLINT

The splint (Figs 4 and 5) consists of 1 thigh piece A, 1 fixed leg piece B, 2 movable leg parts C, and 1 foot plate D.

B, C and D cannot be separated in the assembled splint.

The thigh piece is made up of two nearly parallel rods each 2 feet 3 inches long and $\frac{1}{2}$ inch in diameter. Each is scored by fine longitudinal grooves $\frac{1}{30}$ inch across with $\frac{1}{8}$ inch interval. There are 10 grooves in the inch. The proximal ends of these rods are connected by a specially shaped and arched bar, 17 inches in length, capable of being bent a little in all planes by hand.

The fixed leg piece comprises two nearly parallel tubes connected distally by a transverse part. The tubes are each 2 feet long and have an external diameter of $\frac{5}{8}$ inch and an internal diameter of just over $\frac{1}{2}$ inch. These tubes permit the rods of the thigh piece to slide easily. The distal transverse part is 5 inches in length. It presents an annular constriction in the middle. It is joined to one of the parallel tubes by a rigid rectangular bend, at the junction with the other tube is hammered flat for several inches and is bent in a curve forming one quarter of the circumference of a circle. It is capable of being easily opened a little or closed a little by hand. The proximal open ends of the tubes are each thickened by a collar which is prolonged below into two flanges to provide attachment for the hinge pin upon which one of the movable leg parts moves.

Each movable leg part is 2 feet in length and $\frac{1}{2}$ inch in diameter. It is scored by fine longitudinal grooves 10 to the inch. The proximal end is flattened from side to side and perforated for the corresponding hinge pin of the fixed leg piece. The hinge joint should work somewhat loosely. The distal extremity is thickened so that the foot piece is prevented from ever becoming detached.

The foot plate is $\frac{3}{16}$ inch thick, $4\frac{1}{2}$ inches wide, and 10 inches in length. The edges are deeply milled. On its under surface is a transverse strip $\frac{1}{2}$ inch wide. This is placed $\frac{1}{2}$ inches from one end (the posterior) and $6\frac{1}{2}$ inches from the other (the anterior) end. At each side the transverse

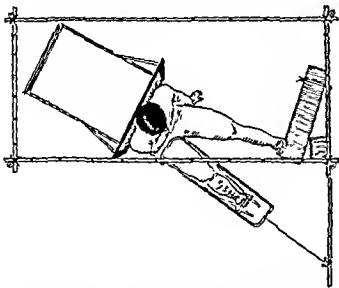


Fig 7. Bird's eye view of ordinary bed adapted for treating a case of fractured femur. This shows 30 degrees abduction of the hip-joint and the oblique position of back rest and patient. The leg clears the side of the bed.

strip projects 1½ inches beyond the foot plate where it thickens to one half of an inch and is perforated by a transversely oval opening (½ inch by ¾ inch) which receives the corresponding movable leg part. A winged screw (attached by a ring and chain to the foot plate to prevent it ever being lost) is capable of being tightened to fix the foot plate firmly at any point to a movable leg part.

Each splint is provided with a score of clips. Each clip is 2 inches long. In section it presents two-thirds of the circumference of a circle (having a diameter of half an inch) with rolled back edges which are filed smooth at the ends. The clip is highly tempered. It fits the longitudinally scored rods of the thigh piece and of each movable leg part quite loosely until a layer of household flannel is interposed when it will be found that the flannel is held sufficiently firmly against the sharp grooves so as to preclude all possibility of slipping. Each clip is pierced by a small hole so that the clips can be kept strung on a line when not in use.

This splint has been made for me most excellently by Messrs Down Brothers (London) and by the Taikoo Dockyard, Hongkong. The splint has been made both in brass (silver plated) and also in duralumin. The former only should be employed as the splint is then more conveniently balanced.

PREPARATION OF BED FOR A CASE OF FRACTURED FEMUR

We have designed a special type of bed for use with this splint which is here briefly described and illustrated. Any ordinary bed can, however,

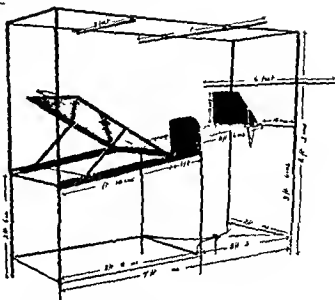


Fig 8. Special bed for treatment of cases of fractured femur. The pieces of iron on which the sections of mattress rest should be perforated for ventilation. The perforations are not shown in the figure. A non detachable crank handle at the foot of the bed for adjusting the position of the foot plate has also been adopted as an improvement since the photograph was made.

easily be employed by converting it into a four poster by means of bamboo or other poles, by using a sandbag or box for the foot plate and by using an ordinary back rest. The latter may be placed somewhat obliquely to enable the leg of the abducted limb to clear the side of the bed more easily. The foot of the bed should be raised one foot in height and fracture boards must be placed beneath the mattress (Figs 6 and 7).

Our special bed is a skeleton four poster of tubular iron (Fig 8). The part on which the patient rests consists of 3 pieces of iron namely (1) a back rest (2 feet 10 inches long) which can be raised and fixed anywhere up to 90 degrees, (2) a transverse strip (1 foot broad) on which the patient sits and (3) a longitudinal strip (3 feet 6 inches long) for the uninjured lower limb. All these slope upward toward the foot of the bed (1 foot in 7 feet 1 inch). Sectional mattresses corresponding to these are required.

A pelvic plate can be attached to the transverse "sitting" strip to keep the patient from sliding off the bed and a foot plate is fixed to the longitudinal "lower limb" piece, so that the patient can keep himself up in bed by locking the sole of his sound limb against it.

The side frame of the bed is interrupted opposite the lower limb piece so that the splint will not knock against the bed even if the abduction of the hip is very slight. In order to maintain the stability of the bed, two middle legs are used and

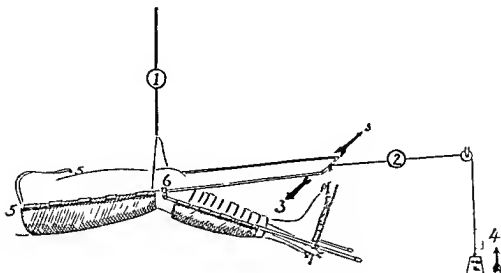


Fig 13 Six points in regard to the splint

Suspend the splint Tie the appropriate movable leg rod to the cross bar of the fixed leg piece close to the right angle. Apply a short loop of cord to the rods of the thigh piece close to the hinge of the knee piece. The knots should be bowlines. At the middle of the loop attach another cord by a bowline. The other end is secured to the suspension bar of the special bed by means of a clove hitch. The splint should be nearly horizontal but with a slight inclination upward of the distal end.

Apply the traction A weight of 10 to 20 pounds is attached to a cord which passes through a pulley on the pulley bar of the bed to the groove on the cross bar of the fixed leg piece. The pulley should abduct the hip-joint 30 degrees.

Final adjustments of the bed A pelvic guard plate should be inserted on the fracture side of the bed. The leg plate on the fractured side should be removed. The foot rest should be adjusted so that with the patient close to the bed rest and the knee straight, the foot touches the foot rest (Fig 12).

Every day the dresser must methodically check the following points:

In regard to the splint (Fig 13)

- 1 The suspension cord must be vertical
 - 2 There must be plenty of room between the end of the splint and the pulley
 - 3 The whole limb must swing freely and painlessly from the hip joint
 - 4 When the traction weight is lifted the splint must not tilt
 - 5 The medial rod of the thigh piece must reach to the tuber ischi
- The lateral rod of the thigh piece must reach just below the tubercle of the iliac crest

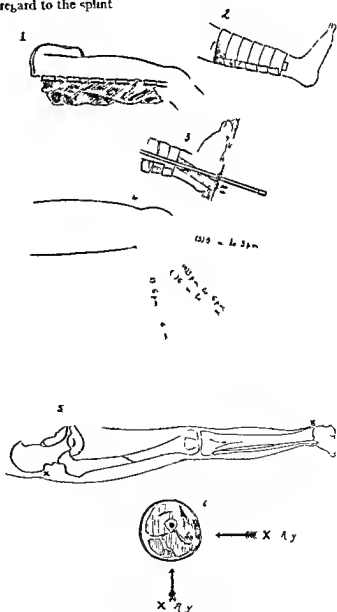


Fig 14 Six points in regard to the limb

6 The axes of the knee and knee flexion hinge joints must correspond

In regard to the limb (Fig. 14)

1 There must be no wrinkles in the supporting flannel

2 There must be no weeping sores beneath the adhesive strapping

3 There must be no excessive puffiness of the foot

4 The position of the knee must be changed during the 24 hours, for instance 6 p. m. to 6 a. m., flexed 90 degrees 6 a. m. to 9 a. m. flexed 45 degrees 9 a. m. to 3 p. m. fully extended, 3 p. m. to 6 p. m., flexed 45 degrees

5 The length must be charted daily anterior superior spine to the medial malleolus and compared to the opposite limb knees being extended and hips in corresponding positions

6 During the first week and during the sixth week roentgenograms in two planes at right angles should be taken. A portable X-ray apparatus for this purpose will usually be unobtainable except in hospitals. If however there is no shortening and the general alignment of the limb is good the lack of the X-ray is of less consequence

THE TYPE OF CASE SUITABLE FOR TREATMENT WITH THIS SPLINT

The splint is used in this clinic for all fractures of the shaft of the femur including those at the upper and lower ends. With the latter that is

supracondylar fractures manipulation under anaesthesia may be necessary to disimpact the fragments. In these cases too the knee may have to be flexed well beyond a right angle and if this is done the front of the leg instead of the calf must be supported with flannel and the traction force comes to press directly upon the sole of the foot through the foot plate

The splint is also very useful for the so-called extracapsular and intracapsular fractures of the neck of the femur. With the former disimpaction under an anaesthetic is usually necessary. For the latter the hip joint is abducted to an extreme degree, and we have succeeded in obtaining bony union at an advanced age after 8 weeks in the splint

The majority of our cases of fractured femur do well with less than half an inch of shortening and free movements at hip and knee joint. But if at the end of a week's careful splinting the alignment is bad or there is more than half an inch shortening further operative measures should be considered. After the fragments have been fixed at open operation the splint is employed without traction by weight and pulley which is no longer necessary

I am indebted to Dr. S. H. To for the care and skill he has expended on the illustrations and to many of my house surgeons and dressers for their assistance in developing this splint and also to Messrs. Down Brothers of London, The Tailor Dockyard and the engineering work shops at the Hongkong University for assistance in working out details

CLOSED DRAINAGE IN SUBPHRENIC ABSCESS

REPORT OF TWO CASES

By JOHN D McEACHERN M D F A C S WINNIPEG MANITOBA

SUBPHRENIC abscess is one of the most serious conditions that the surgeon is called upon to treat. A perusal of the literature on the subject shows that about one third of patients operated on and more than three quarters of patients not operated upon die from the affection. Moreover, in the patients who do recover after operation the convalescence is often greatly prolonged and the final result unsatisfactory.

Because of the delay in diagnosis many of these patients, when surgical treatment is undertaken are exceedingly ill, being worn out from prolonged sepsis. They are, therefore, poor surgical risks.

Except in the unusual cases in which the abscess has become so superficial that it can be opened through an abdominal incision without entering the general abdominal cavity, the operation generally practiced for a right sided subphrenic abscess has been the transpleural one,

with resection of the eighth, ninth, or tenth ribs. This is a surgical procedure of considerable magnitude and in extremely weak patients will carry a high operative mortality.

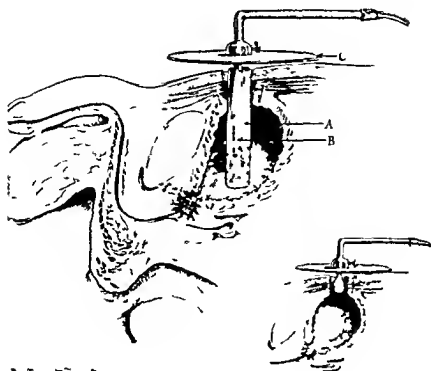
The diaphragm in these cases is pushed up on the affected side sometimes as high as the third or fourth rib, with resulting lung collapse. The abdominal viscera are frequently greatly displaced and fixed in their new position by inflammatory reaction. After open drainage, the abscess cavity, on account of the rigid nature of its walls, may drain for months before it is obliterated. During this long period of suppuration, there is a decided tendency for the drainage opening to close before healing is completed. In subphrenic abscess, therefore, we have a condition presenting difficulties of treatment in many respects allied to empyema, and it was on account of success in the treatment of this latter malady by closed drain-



Fig 1 Case 1 Showing elevation of diaphragm on the right side. The double headed arrows indicate the area containing gas beneath the diaphragm.



Fig 2 Case 1 Roentgenogram taken with the patient on the left side showing the position of the fluid level with the gas above.



into the large tube or for intermittent lavage when the fluid is introduced in to the tube A through a catheter in the early stages and through the urethra in the later stages. In both instances the fluid is immediately pumped away without the slightest spilling thus avoiding any disarrangement of the bed.

A Sprengle pump attached to the water main is the aspirating mechanism and certain rooms in the hospital are set aside for bladder cases.

The essential principle in the system seems to be that an enormous quantity of air is pumped

through the bladder. The air inhibits aerobic and anaerobic bacterial growth and has a drying effect so that the wound heals under the same conditions as does a clean laparotomy incision.

In our clinic this method faithfully carried out has marked as distinct an advance in the treatment of prostatic patients as did careful pre-operative treatment. It has also robbed these cases of their unpleasant circumstances for the surgeon and for the patient but above all for the hospital and nursing staff because it requires very little attention and eliminates the unpleasant odor.

THE OPERATIVE TREATMENT OF UNUNITED FRACTURE AT THE HIP

By ROYAL WHITMAN, M D F A C S, NEW YORK

IN SURGERY, GYNECOLOGY and OBSTETRICS for June, 1921, I described an operation for ununited fracture of the neck of the femur. It was designed primarily for a class of cases in which, because of absorption of the neck, bone pegging, at that time more in favor than at present, could be of little avail.

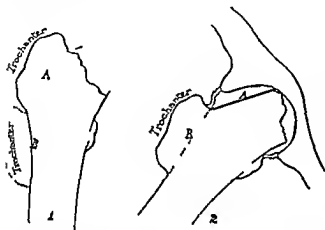


Fig 1 The condition in ununited fracture of the neck of the femur in which the neck has entirely disappeared

Fig 2 The new bearing surface provided by removing the trochanter and transplanting it lower down on the shaft

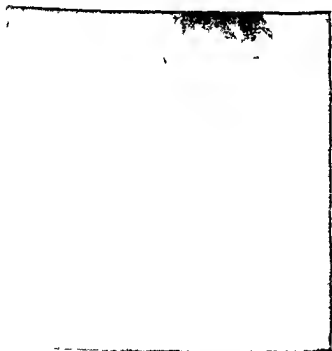


Fig 3 An ununited fracture of the neck of the femur in which the neck has been completely absorbed

The operation, first performed in 1916, consisted in removal of the head of the femur. The trochanter was then cut through at its base with its attached muscles and turned upward. The new bearing surface or improvised neck thus obtained was placed in the acetabulum at an angle of abduction of about 25 degrees and the trochanter with its attached muscles was then drawn downward and implanted on the outer surface of the femur from which the cortex had been removed at a sufficient tension to support the femur in the new articulation. Thus the distance between the origin and insertion of the abductor muscles having been restored, the voluntary control of this most important range of motion was assured. For these reasons it was called the reconstruction operation.

In the description it was compared with two alternative procedures, which involved the removal of the head of the femur.



Fig 4 The effect of the operation in reconstructing a neck and restoring muscular leverage

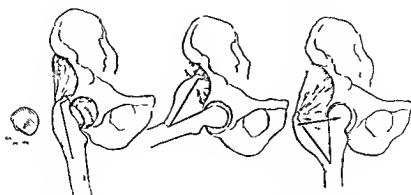


Fig. 7 Albee's method of treating ununited fractures of the neck of the femur by removing head of femur and producing greenstick fracture the trochanter being swung outward on the periosteal hinge. The remains of the neck of the femur and upper end of the great trochanter are to articulate with the acetabulum the inverted portion of the capsular ligament contributing to the formation of the new articulation.

The first of these was employed by Dr. Galloway of Winnipeg, who inserted the entire trochanteric extremity in the acetabulum. The second one of these procedures was that of Dr. Albee who sepa-

rated the trochanter from the shaft with an osteotome sufficiently to permit the introduction of the upper extremity of the femur to the acetabulum.

In a recent paper,¹ Dr. Albee states that his procedure was misrepresented by me, particularly in the criticism that the trochanter in its elevated position involved a complete loss of leverage, therefore lessened muscular control with a consequent tendency toward flexion and adduction, also that the copy of his diagram was incorrect. I therefore reproduce Dr. Albee's original figures from his book *Orthopedic and Reconstructive Surgery* 1919. I think that the relation of the trochanter to the acetabular rim and to the origin of the abductor muscles will indicate loss of leverage, and the consequent limitation both of the voluntary and passive range of abduction that justifies my criticism.

It appears, however, that this original operation has been radically modified, as is evident from a comparison of the two diagrams 1919 and 1925, in order to construct what Dr. Albee calls a "physiological bone muscle lever." This introduces a new element to the discussion.

The purpose of the reconstruction operation is to provide a secure support in locomotion which will permit a useful degree of voluntary movement without danger of subsequent deformity. This also, I assume, is the purpose of the Albee procedure and on this basis the two may be compared.

The reconstruction operation has from this standpoint three distinct advantages. The first is simplicity of design. The second is ease of execution, since it does not involve extensive stripping

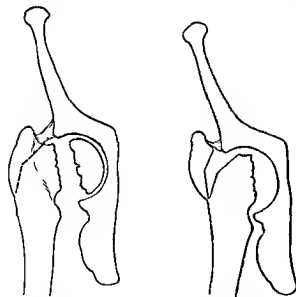


Fig. 5 and 6 Old ununited fracture of the neck of the femur with erosion of most of head and neck and with marked osteoporosis of the remaining shell of the head. The trochanter is separated with osteotome as shown by dotted lines in Figure 5 and forced outward with the overlying soft structures below as a hinge. The removal of the head then allows the neck to be displaced into the acetabulum. Albee 1919.

Figures 5 and 6 from Albee's *Orthopedic and Reconstructive Surgery* 1919. Figures 7 and 8 from *J. Am. Med. Ass.* 1925.

Albee F. H. *Reconstructive and plastic operations on the hip*. *J. Am. Med. Ass.* 1925 LXV 1345.

of the tissues from the pelvis nor splitting the shaft of the femur, with consequent reduction of the weight bearing area. This is a point more clearly shown in Dr Albee's original sketch than in the somewhat idealistic Figure 7. The third advantage is the comparative certainty of the result, since the stability of a lever formed from a fragment widely separated from the shaft is necessarily dependent upon the uncertainties of repair and the adaptation of the tissues to the conditions.

I am interested in Dr Albee's statement that bone pegging is advisable in not more than 10 per cent of ununited fractures at the hip. This is certainly an admission from such an enthusiastic exponent of this procedure, and it confirms my opinion that if non union follows in a case in which it has been demonstrated that the fragments have been accurately apposed for a sufficient time, it indicates such an incapacity for repair, that further efforts to secure direct union are of very doubtful expediency. In such cases one has now the choice between the reconstruction and the physiological bone muscle lever operation which Dr Albee calls "his reconstruction operation."

In order, therefore, to avoid confusion I suggest that the term reconstruction operation be limited to the procedure that I have described for the following reasons:

First, priority. The operation has been employed practically unchanged during the past 10 years, and is now supported by a large background of practical experience. It has consequently an established place in hospital records and in surgical literature.

Second, the title is descriptive, in the sense that the operation represents an attempt to restore the



Fig 8 Result after bone muscle lever has united in place, illustrating the wide distance between the great trochanter and the side of the pelvis in proximity to the rim of the acetabulum, thus allowing for generous abduction. Albee 1925

former mechanical relation of the components of the hip joint.

It seems to me that Dr Albee's secondary title of bone muscle lever operation should be chosen to designate a procedure which, although it may be physiological, has no counterpart in human anatomy.

INSULIN-GLUCOSE TREATMENT OF SHOCK¹

By DAVID FISHER M.D., BOSTON, MASSACHUSETTS
 Fifth Surgeon of the Naval Military Hospital, Lexington

THE term shock was introduced in 1795 by James Latta to describe the condition following severe injury. Shock may be defined as a general exhaustion of the vital centers arising from an injury or profound emotion. There are many theories as to the cause and essential nature of shock, but none is entirely satisfactory. Henderson thinks it is due to a deficiency of carbon dioxide in the blood. Boice claims it is due to cardiac spasm following exhaustion. Meltzer regards it as an inhibition of bodily functions in general. Keen and Mitchell over 50 years ago regarded it as the result of vasomotor failure. The greatest modern advocate of this is Crile. The vasomotor theory maintains that there is exhaustion or inhibition of the vasomotor mechanism; the exhaustion is gradually induced; inhibition is suddenly induced.

Shock for the purpose of this discussion may be classified as traumatic, septic or toxic, anaphylactic, and that due to worry, fear, excessive muscular exertion, hemorrhage, starvation, and insomnia. Cannon (2) has accumulated evidence that the initiating factor in traumatic shock is a toxic agent developed in the damaged tissues, and that the sustaining factor is a low blood pressure. The low blood pressure in both clinical and experimental shock is explained by a diminution of the blood volume, an actual decrease in the amount of fluid which is kept circulating. McEivier and Haggart (13) crossed the circulation of two cats, caused shock in one, and allowed its blood to flow through the vessels of the second cat. They feel that they have obtained evidence suggesting that some substance capable of producing shock is taken up by the circulation from a traumatized area. In 1910 Henderson (11) pointed out that in the absence of an adequate supply of oxygen the development of acid substances in the tissues might be expected in consequence of the partial asphyxia. Later Crile (4) and his co-workers reported results which indicated that a condition of acidosis is present in various clinical states including shock. In 1917 while studying the toxæmia of gas gangrene, Wright observed a reduction of the alkalinity of the blood stream as determined by titration with acid to a certain end point. Patients suffering with gas gangrene have many of the symptoms of shock, and Wright felt that the acidæmia as

he called it, was the cause of the symptoms. Porter (16) believes that fat embolism is the cause and has actually demonstrated these emboli in the blood stream. Crile (5), who has devoted a great deal of thought to this subject, has shown, working with animals that constant stimuli sent to the brain centers will cause shock, and these brains examined histologically, show a hyperchromatolysis then a hypochromatolysis of the cells, together with degeneration of the cells of the liver, thyroid, and adrenals, in other words a state of exhaustion. He then showed that the brains of humans dying of infection and eclampsia show the same condition.

To sum up, shock may be considered as the result of an intense stimulation of the kinetic system by physical exertion, emotion, trauma, toxins, anaphylaxis, etc., which leads to physical changes in the kinetic system, and which if carried far enough exhausts that system. The kinetic system continues to be activated so long as there is life, but normal activation does not cause exhaustion. The difference between shock and normal processes is one of intensity and not of kind. The shock following a long general anesthesia may be attributed to the internal asphyxia and acidosis as well as to the trauma incident to the operation, the hemorrhage and the absorption of the crushed muscle tissue. The border line between a severe postoperative acidosis and pure shock is a difficult one to draw, and for clinical and therapeutic purposes need not be separated. During health the heat energy of the body is derived principally from the combustion of the carbohydrates and to a lesser degree from the fats and protein. Under these conditions, there is of course a great excess of antiketogenic material. When no carbohydrate is available, the heat energy then must come from the fat, and to a much less extent from the protein. The balance is now thrown in the other direction, and there is a great excess of ketogenic material which is not entirely compensated by the small amount of carbohydrates obtainable from the protein. There is in consequence a great production of ketones. The ketone acids then combine with the alkali of the blood stream and reduce the carbon dioxide combining power. This decrease in the alkali reserve is accompanied by a diminished alkalinity of the blood.

stream. These same conditions are present in involuntary fainting in prolonged vomiting in cyclic vomiting after etherization and at the onset of some of the acute infectious diseases.

The theoretical and laboratory aspects of this problem have recently been further studied by Levine, Gordon and Derrick (12). They studied the changes in the chemical constituents of the blood following a marathon run and showed that a correlation existed between the blood sugar level and the physical condition of the runner at the finish. Those who had a normal sugar content showed no signs or symptoms of shock. Four runners who were markedly prostrated and in fact, one who was unconscious had a very low blood sugar and presented the typical picture of an overdose of insulin. With all of this evidence before us it readily becomes clear that to combat the symptoms of shock rationally we should devise some method whereby the body can be furnished with a substance that will give rise to an immediate supply of energy and maintain that supply so long as becomes necessary at the same time furnishing fluids to keep up the circulating fluid volume.

The usual methods of treatment heretofore have been directed toward maintenance of the fluid volume, elevation of blood pressure and retention of body heat. The fundamental cell pathology, the internal asphyxia and acidosis and the initiating factors of the shock have to a great degree been disregarded. The fluids used have been normal saline, glucose, soda, etc., with or without adrenalin or pituitrin.

As to the value of pituitrin and adrenalin in shock. Adrenalin when introduced into the circulation in therapeutic doses, causes a rise of blood pressure and cardiac stimulation. While this action would indicate its use in surgical conditions associated with low blood pressure, experience has shown that even under these conditions its value is limited. Even when it is given intravenously, its action is very brief, the total rise in blood pressure lasting only a few minutes.

In traumatic shock, while a rise of blood pressure may be secured, it leads to no permanent benefit. Cannon (3) states that the rise in blood pressure results from increased resistance in the tips of the arterial tree, with accumulation of blood in the arteries. This accumulation may lead to a temporarily better flow through the heart muscles and cerebral vessels. The increased arterial pressure gives a wholly spurious impression of the state of the circulation. Jamming the blood back in the arterial portion of the circula-

tion obviously does not increase the volume flow through the capillaries where it is most needed. In the British and American armies the use of vasoconstrictor drugs practically disappeared during the recent war.

In low blood pressure due to acute hemorrhage or to hemorrhage and shock, the use of adrenalin is even less advisable. Since the effect of adrenalin in low blood pressure is not of permanent benefit and may be harmful if excessive doses are used, measures to prolong its action as by continuous instillation in saline solution are not advisable.

Our conception of shock is that in this state an internal asphyxia and acidosis with oxidative processes held in check or they may result in a state of exhaustion. I personally believe that this state is primarily caused by a sudden derangement of the central nervous system. Whether these two conceptions are correct or not any method promoting combustion and oxidation and at the same time furnishing heat energy should be effective in combating shock.

In a previous communication before this congress (7) I described the specific results obtained in pre-operative non-diabetic acidosis by the use of glucose solution given intravenously and insulin hypodermically and confirmed the original work of Thalhimer (10) in postoperative non-diabetic acidosis who used the same method. Following this, I believed that the insulin and glucose so combined should be just as effective in shock as in non-diabetic acidosis, for the underlying pathology is very similar, since here it was possible to furnish an immediate supply of heat energy and fluids, and maintain that supply so long as becomes necessary. I soon had an opportunity to try this and in two recent publications (8, 9) described the apparently specific response of shock as seen clinically, to glucose solution administered intravenously and insulin hypodermically. Since that time we have treated 31 cases successfully in our clinic, and have received confirmatory reports from several American clinics and one Canadian clinic. The following are typical case reports of the action of insulin and glucose in our hands in the treatment of shock.

CASE 1. Mr. H. A., aged 25, had an arthrodesis of the shoulder joint for tuberculous. The operation lasted 2½ hours. During the course of the operation the pulse climbed from 96 to 120 respirations from 18 to 38, and the systolic pressure fell to 75. Just as the cast was being applied the patient became pulseless the rate could not be ascertained respirations increased to 40 and were very weak and shallow. The application of the cast was immediately discontinued. The patient put to bed and given

1 000 cubic centimeters of a 10 per cent solution of glucose intravenously and 50 units of insulin subcutaneously in divided doses. The reaction in this case was marvellous. The pulse quality began to improve almost immediately and 2 hours after the administration the rate was 116 volume good respirations 22 and the blood pressure 112-74 application of the cast was resumed and convalescence was uneventful. Urine examination made immediately after the insulin glucose injection was started showed acetone three plus and a trace of diacetic acid. This was absent in a specimen examined 8 hours later.

CASE 2. Mrs. A. W. aged 64 was operated upon for gall bladder disease. A large stone was removed and the wall of the gall bladder was seen to be gangrenous. Because of the poor condition of the patient the gall bladder was drained and the abdomen hurriedly closed. At the termination of the operation the temperature was 99 pulse rate 66 respirations 20. The pulse and temperature began to climb and 24 hours later the temperature was 104.8 degrees F pulse rate 140 respirations 36 the quality of the pulse very poor respirations shallow and the patient was irrational and delirious. I felt that in this case I was dealing with a case of toxic or septic shock complicated with a severe postoperative acidosis as proved by the urine examination. One thousand cubic centimeters of a 15 per cent glucose solution were given and 60 units of U 20 insulin. The insullation occupied 2½ hours. Six hours later the pulse rate was 108 temperature 102.4 degrees F respirations 22 mentality clear and the urine examination showed absence of acetone or diacetic acid. In this particular case the dilution of the circulating toxins amounted to 20 per cent which I believe is one of the factors in the recovery. The removal of the internal asphyxia and acidosis enabled the body cells to regain their normal equilibrium and combat the shock.

CASE 3. Mr. J. M. was sent in with signs and symptoms of a perforated peptic ulcer of 5 hours duration. One hour before admission his stomach was washed with 2 quarts of tap water by his family physician and because no return was obtained he was sent to the hospital. On admission the pulse was weak thready rate 168 respirations very shallow rate 36 temperature 96.6 and systolic blood pressure 75. At operation a perforation on the posterior surface of the pyloric end of the stomach the size of a silver quarter was cauterized sutured by the purse string method and proper drainage instituted. During the course of the operation 1000 cubic centimeters of a 10 per cent solution of glucose were given and 50 units of U 20 insulin and the patient was kept warm on the operating table until the termination of the infusion. Five hours later the pulse rate was 120 of excellent quality respirations 24 temperature 99.8 blood pressure 110-80. Convalescence was uneventful.

CASE 4. Mr. D. L. aged 52 was admitted for acute abdominal pain incessant vomiting and high temperature. On a previous admission he was operated upon for empyema of the gall bladder with perforation the gall bladder being drained only on account of his poor condition. He refused a secondary operation for removal of the gall bladder and was discharged. At this time the diagnosis was perforation with peritonitis. A gangrenous perforated gall bladder was removed and a frank peritonitis was present. When he was returned to bed the pulse rate was 178 respiration 44 and temperature 100. One thousand cubic centimeters of a 15 per cent glucose solution were given and 75 units of U 20 insulin over a period of 3 hours. The quality of the pulse began to improve almost immediately and 4 hours after the administration the pulse rate was 114 of good volume respirations 24 and temperature 102.2 degrees F. The next day the patient relapsed into

a condition we felt to be toxic shock and the same amount of insulin and glucose was given as on the previous day and just as favorable response was obtained. The temperature was lowered over 2 degrees in the afternoon at a time when we would normally expect a rise. Following this the patient went through the usual course of a peritonitis and made a good recovery.

CASE 5. Mr. A. L. aged 34 was admitted for acute fracture of the twelfth dorsal spine. All the usual neurological symptoms of a transverse lesion of the cord at this level was present. A laminectomy was performed and during the operation it was necessary to resuscitate the patient twice. He was returned to bed in intense shock. It was impossible to count the pulse the respirations were weak and shallow rate 48. Two thousand cubic centimeters of a 10 per cent glucose solution were given over a period of 3 hours and 60 units of U 20 insulin in divided doses. Four hours later the pulse rate was 116 respiration 28 and no further trouble was experienced. Five days later he was again operated upon because he had not been relieved. A completely crushed cord was exposed and he showed symptoms of intense shock. He was given 1000 cubic centimeters of glucose and 40 units of U 20 insulin and 5 hours later he was out of danger.

In shock as in nearly all abnormal conditions we have a state of perverted body metabolism. In addition to this, the entire body is in a state of exhaustion and to overcome this exhaustion a source of energy is needed which will readily revive the dying cells. Glucose administered alone cannot always do this satisfactorily or quickly enough. We know definitely, as a result of the splendid experiments carried out by Ringer (18) that insulin oxidizes glucose, hence the introduction of the insulin causes a rapid oxidation of the glucose and supplies the energy needed.

Since time is always an important factor in the treatment of shock the tremendous advantage of the insulin and glucose over glucose alone can readily be seen. The value of this treatment has been confirmed by Gunsberg (10) writing in the *Journal of the American Medical Association*. He treated a boy aged 11, suffering with a left Pott's fracture and contusions of the chest and abdomen. The day after the injury, the patient vomited incessantly and went into shock. The pulse ranged from 130 to 140 respiration 50 to 55 and the temperature was 100 degrees F. At 3 p. m. he was given insulin and glucose and the next morning he had fully recovered. The urine which previously had shown four plus acetone and diacetic acid was now entirely negative. Here a condition which was progressing rapidly toward extremis was immediately transformed into one of normal convalescence through the use of insulin and glucose.

METHOD

A sterile solution of glucose is used preferably of 10 to 15 per cent strength. Five hundred to

two thousand cubic centimeters may be given, depending upon the severity of the condition. The usual cautions for any intravenous medication are taken. The solution is allowed to flow slowly into the veins so that the entire time of administration should be at least 1 hour, and preferably 2 to 4 hours. This precaution is extremely important when any large amount of fluid is introduced into the veins, for dilatation of the right heart is a real danger, and many serious results have ensued because of the too rapid rate of intravenous administration. The amount of insulin used depends upon the amount of glucose injected. For every 3 grams of glucose, 1 unit of U 20 insulin may be used. The total amount of insulin to be given should be divided into 2 equal doses, and 1 part given about 15 minutes after the administration of the glucose has started, and the remainder given at the end of the administration. As long as glucose appears in the urine, there is no danger of an insulin reaction, for this acts as a safety guide, and shows that there is more glucose in the blood stream than can be taken care of by the introduced insulin. It is well for the nurse always to have ready a hypodermic syringe of adrenalin when this treatment is given, for then any reaction can be easily and quickly counteracted. Besides the adrenalin, the juice of an orange or ordinary cane sugar can be used. We have never had an insulin reaction when we have used the above formula. It is well to give fluids by rectum at the same time in order to overcome the tendency of glucose to deplete the body of its fluids, since glucose acts as a diuretic.

Aside from using it in the treatment of non-diabetic acidosis and surgical shock, I have used insulin and glucose to check the incessant vomiting of acute peritonitis. I also use it in the preoperative preparation of all surgical cases as a prophylaxis when the subject is not considered a good risk, and in all postoperative gastric cases, particularly in cases of gastric ulcer and resection. The patient is fed for days at a time through his veins. In Ochsner's (14) clinic, insulin and glucose is now being used in all cases of pernicious anemia when blood transfusions have had no effect.

It is important to remember in connection with this, that certain drugs used simultaneously with insulin may diminish or nullify its effect thereby accounting for some of the uncertain results obtained with it. Burn has shown that if pituitrin is given at the same time, the fall of blood sugar is diminished and sometimes abolished. The effect of a small dose of insulin is decidedly increased when ergotoxin is injected previously.

The question logically arises, and rightly so. What is the rationale behind this treatment?

In shock we have an initiating factor and a sustaining factor. The initiating factor may be sepsis, trauma, anaphylaxis, the sustaining factor is a low blood pressure, maintained by an actual decrease in the circulating fluid volume. In the first place, the introduction of the glucose into the blood stream raises the circulating fluid volume, thereby helping to remove the sustaining factor. The introduction of the insulin causes the rapid oxidation of the glucose, in the process of this oxidation, heat energy is given off to the cells which aids them in this time of need to regain their equilibrium and discharge their normal metabolic functions. The body cells when in a normal state possess remarkable power to adjust themselves to changing conditions, and in conjunction with the buffer salts of the blood stream, can usually emerge from a state of internal asphyxia and acidosis. I cannot help but believe that the heat energy supplied to the cells by the rapid oxidation of the glucose at a time when normal oxidative processes are checked or held in abeyance, is a tremendous vital factor in initiating the process of recovery of the cells.

Aub (1) studied the decrease of the metabolic rate in shock, which in 8 cases showed an average decrease of 33 per cent. He learned that the fall in metabolism was related in a way to the critical level of arterial blood pressure as indicated by the appearance of an acidosis. The introduction of the glucose and its subsequent rapid oxidation through the means of the insulin not only serves to raise the pressure, but also to increase the metabolic rate. In addition, we know from the work of Edwards and Page (6) of Cornell that the intravenous injections of glucose have a remarkable improving effect upon hypodynamic hearts, a condition usually found in shock. O'Neill, Manwaring, and Bing Moy (15) have shown that in anaphylactic shock in dogs, practically all the glycogen disappears from the liver in 15 minutes. They proved this both microscopically and by chemical analysis thereby confirming the earlier work of Zunz and LaBarre (20). We know from the work of Richter, that insulin with glucose causes the deposition of glycogen in the liver. Richter gave daily infusions of insulin and glucose to a patient with acute yellow atrophy. The comatose condition of the patient was immediately relieved. After death, the liver was examined and found to contain glycogen, a fact contrary to that obtaining in cases of acute yellow atrophy not so treated. We know from the work of Thalheimer

that insulin with glucose has a specific effect upon the pernicious vomiting of pregnancy and in eclampsia.

From the work of Zunz, La Barre and the Leland Stanford investigators it seems that the first defensive reaction of the organism in shock is the mobilization of all the available glycogen in the blood stream to be distributed to the body cells to furnish them energy. This supply is soon exhausted however as these men have shown hence the replenishing of the glycogen as by insulin and glucose therapy is to me of extreme importance in the rational treatment of shock.

I do not wish to leave the impression that insulin and glucose are a panacea for all evils nor will their administration supplant blood transfusion in shock caused by great loss of blood but in the fields discussed its action has been far more efficacious and rapid than by any method heretofore utilized. Irrespective of our theorizing however clinically it appears to be efficacious and in the final analysis that must be our chief criterion.

DISCUSSION

DR ALBERT J. OLSNER: Dr Fisher's work and his results are promising and interesting. I have not had the experience with insulin and glucose that he has had but in a few cases I have had the same results as he. Dr Fisher mentions a case of pernicious anemia apparently benefited by insulin and glucose. We had a very interesting experience in such a case.

When the patient was admitted to the hospital the red blood cells were 984,000, white blood cells 5,400, with hæmoglobin 40 per cent she belonged to blood group IV.

On March 16, 1925, the day after admission 650 cubic centimeters of blood was transfused by the Percy method. Donor and recipient were both of Group IV. On March 23, 1925, another transfusion was made without the patient being regrouped. Group IV donor being used. Severe reaction followed the transfusion with a lowering of the blood count. On March 30 the patient's blood was regrouped with the result that definite agglutination took place with standard sera both II and III. The patient's serum was matched with the red blood corpuscles of four different Group IV donors and in every case marked agglutination resulted. From March 30 to April 6 the patient's condition became progressively worse she could retain nothing had diarrhœa and was semi-conscious. The serum again matched with the blood of individuals belonging to the following groups: Group I one person, Group II 6 persons, Group III 1 person, Group IV 9 persons. There resulted a definite and positive agglutination in all 17 of these cases.

Because of the critical condition and acetone odor to the breath she was given 300 cubic centimeters of a 10 per cent glucose solution by the drop method intravenously so that about 1 hour was taken for its administration. Fifteen units of insulin was given hypodermically. On April 7 the general condition was very much improved with no more vomiting. On April 8 and 10 she was again given 300 cubic centimeters of 10 per cent glucose solution with insulin. The general condition changed completely. The appetite became voracious, the skin lost its waxy appearance and the lips began to have some color. The blood picture also changed completely, the red blood cell increasing up to above three million with a hæmoglobin of 60 per cent.

On May 1 she complained of a glossitis. The differential blood count showed a relative lymphocytosis. She was again given glucose intravenously together with insulin which caused a prompt disappearance of all glossitis symptoms and brought about a normal blood picture. She was again grouped and found to belong to Group III. Her serum was matched with the blood of 11 persons belonging to Group II with a positive agglutination in each case. It was matched with the blood of 6 persons belonging to Group IV with no agglutination.

The case emphasizes the advisability of matching the blood in cases of pernicious anemia before doing a transfusion. Group IV cannot be considered as a universal donor in certain cases of pernicious anemia. The patient received the first transfusion with very beneficial results which showed that at that time the bloods of donor and recipient were compatible. While under observation however the entire character of the patient's blood changed. The blood became rigid as evidenced by an agglutination when her serum was matched with the blood corpuscles of all other groups including Group IV which is characterized by the inability of its red blood cells to be agglutinated by any serum.

During the patient's decline her condition became so alarming that death seemed imminent. Because of the rigid character of her blood it was impossible to resort to blood transfusions and the case appeared hopeless. Glucose with insulin was administered with a very remarkable result. Whether the beneficial effects were due to the combining of the acids which was undoubtedly present or to a possible effect upon the disease process itself cannot be decided because later when the glucose and insulin were given the glossitis and the relative lymphocytosis disappeared even though no acidosis was present. One may possibly assume that the glucose and insulin exerted some effect upon the general metabolism of the body to bring about an alleviation of the symptom. However one must be extremely careful and cautious in attributing any betterment to any one therapeutic agent in cases of pernicious anemia as one finds in the literature numerous reports of cases apparently in a hopeless condition which have gone into a spontaneous remission without any form of therapy.

I examined the patient personally May 17 1925. She has maintained her excellent condition. Whether this will be continued it is impossible to say.

Insulin-glucose therapy seems rational in the treatment of shock, and should prove very valuable in addition to the measures already in vogue. I have seen some of Dr. Fisher's work in his clinic at Milwaukee, and the results they secure with insulin-glucose are very impressive.

DR. GEORGE W. CRILE. It has often been maintained that the central nervous system can be separated from the field of operation in shock. I do not believe this can be done. In shock, there is always present an interference with the internal respiration. I believe that the anesthesia caused by the administration of general anesthetics is due primarily to this interference. I should like to make three points in regard to the prevention of surgical shock: first, there should be as little general anesthesia as possible; second, the internal acidosis should be relieved; third, the operation should be carried out with as little loss of blood as possible and as rapidly as is consistent with safety.

Our object heretofore has been to maintain blood pressure merely to improve the internal respiration. Now comes Dr. Fisher's work attacking this very point in the treatment of shock. In a limited number of cases we have secured results paralleling those reported by him.

DR. FISHER, closing the discussion. In treating shock, it is just as illogical to focus the attention upon the blood pressure or the temperature or the fast thready pulse, as it would be to treat the headache only in a case of brain tumor. These are just manifestations of an underlying abnormal process. This process, I believe, is mainly an interference with the internal respiration causing internal acidosis and asphyxia resulting in lessened oxidations within the cell. By promoting and improving such oxidative processes, we will promote the recovery of the body cells and hasten recovery from shock. I feel as Dr. Crile does that the problem of internal respiration is not the entire picture in shock, but a successful handling of this phase will to a great degree, prevent many of the dangers accompanying shock. My method is simple, requires no elaborate apparatus nor mysterious technique, and can easily be given at the bedside.

BIBLIOGRAPHY

1. AUB, J. C. *Am J Physiol* 1920, liv 388.
2. CANNON, W. B. *Studies in experimental traumatic shock*. Arch Surg 1927, lv 1.
3. CANNON, W. B. *Traumatic Shock*. New York: D. Appleton and Company, 1923.
4. CRILE, G. W. *Origin and Nature of Emotions*. Philadelphia: W. B. Saunders, 1916.
5. CRILE and J. OWER. *Anoci Association*. Philadelphia: W. B. Saunders, 1915.
6. EDWARDS, D. J. and PAGE, H. I. *Observations on the circulation during hypoglycemia from large doses of insulin*. *Am J Physiol* 1924, lxx 177.
7. FISHER, DAVID and SNEEL, M. W. *Insulin treatment of pre-operative and postoperative non-diabetic acidosis*. *J Am M Ass* 1924, lxxvii 699.
8. FISHER, DAVID and SNEEL, M. W. *Treatment of shock with glucose infusions and insulin*. *J Am M Ass* 1924, lxxviii 1906-1908.
9. FISHER, DAVID and MENING, E. H. *Insulin-glucose treatment of surgical shock and non-diabetic acidosis*. *Surg. Gynec. & Obst.* 1925, xl 548-553.
10. GINSBERG, GEORGE. *Use of insulin in case of acidosis following trauma*. *J Am M Ass* 1924, lxxvii 1517.
11. HENDERSON, LANDELL. *Am J Physiol* 1910, xlviii 167-174.
12. LEVINE, S. A., GORDON, B. and DERRICK, C. L. *Some changes in the chemical constituents of the blood following a marathon run*. *J Am M Ass* 1924, lxxviii 1718-1720.
13. McIVER, M. A. and HAGGART, W. W. *Traumatic shock. Some experimental work on crossed circulation*. *Surg. Gynec. & Obst.* 1923, xxxvi 542-546.
14. OCHSNER, ALBERT J. *Personal communication*.
15. O'NEILL, F. I., MANNING, W. H. and MOY, B. H. *Qualitative changes in hepatic glycogen during shock*. *J Am M Ass* 1925, lxxviii 2102.
16. PORTER, W. *Am J Physiol*.
17. RICHARDSON, E. I. *Surgical application of epinephrin*. *J Am M Ass* 1924, lxxviii 15.
18. RINGER, M. *Influence of insulin on phlorizin diabetes*. *J Biol Chem* 1923, lxxii 483.
19. THACHUMER, W. *Insulin treatment of non-diabetic postoperative acidosis*. *J Am M Ass* 1923, lxxi.
20. ZUNT, C. and LA BARRE, J. *A propos des variations du sucre libre du sucre protéidique et du lactate lactique lors du choc anaphylactique chez le cobaye*. *Compt. rend. Soc. de biol.* 1924, xci 11.

I wish to thank Dr. Frederick J. Cotton for his kindness in reading the proofs.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D.
ALLEN B. KANAVEL, M.D.

Managing Editor
Associate Editor

WILLIAM J. MAYO, M.D.

Chief of Editorial Staff

AUGUST 1926

MEDICAL EDUCATION IN GREECE

AFTER a year spent in Greece in close contact with the best and most influential elements of Greek society as well as the rank and file it is plain to me that most Americans have erroneous ideas regarding modern Greece. Education is universal in Greece and their system of compulsory primary education is the oldest in the world while their system of secondary schools for both men and women will compare favorably with that of other countries. Their language has hindered a better understanding of other nations as it has also prevented a more exact knowledge of them. This condition will be improved in the near future as the adoption of the study of English becomes more widespread. Time and attention formerly being stowed upon German is now rapidly being given to English in fact at present as a result no doubt of the great aid from Americans during the war and following the Smyrna disaster, English is received more favorably than French. In Greece at present, radical reconstruction work is going on along every line and it would be well for American pro-

fessional and business men to take a more active interest in them as the Greeks are now more susceptible to American influence than to any other. They are fully aware that practically all other influences are heavily tinctured with selfishness.

The University of Athens is a real University and the medical school is built on modern principles of medical education, although largely from French and German models.

In studying modern Greece one must keep constantly in mind the fact that Greeks are hampered and retarded by an amount of tradition which exists in few other countries. Their great pride in their traditions is in many ways a handicap. The University is under the control of the state and includes the departments of theology, the arts and sciences, medicine, engineering, dentistry, and a number of other branches of learning. There have been medical schools in Greece since ancient times but the present school as a department of the University is of comparatively recent development.

A well arranged catalogue gives the various courses of the school in sufficient detail. Women are admitted on the same terms as men, and a considerable number are in attendance. The medical course covers five years of two terms each. This gives the student the equivalent of a master degree and will admit him to practice. In order to receive the degree of doctor of medicine he must have one year of post graduate (internship) work and present a thesis. Foreign physicians are admitted to practice on the presentation of acceptable credentials and an oral examination in seven fundamental subjects.

I spent considerable time in visiting the medical school, and in attending its clinics and lectures. There are at least thirteen main buildings which house the principal part of the medical school and its clinical facilities, and there are a number of smaller and less important ones. It should be borne in mind that at the time of my visits to the various lectures, clinics, and laboratories of the school, they were seen at a great disadvantage. During the years of the war the school has been closed. Some of its best teachers had been dismissed on account of their political sympathies, and the school was in the process of reorganization. In fact, the political control of the university is one of its misfortunes.

The University building is situated in the center of Athens on a broad avenue called University Street, and only a block away is the main laboratory building occupying a whole block and providing for the departments of physiology, anatomy, pathological anatomy, pharmacology, neurology, special pathology, etc. In the dissecting rooms of the anatomical laboratory the first and second year students were earnestly and industriously at work at practical dissection under the direction of the head of the department and several assistants. Bacteriology and general pathology are taken care of in still another building, and just outside the city on the Sacred Way are laboratories where vaccines and serums are manufactured. This is called the Pasteur Institute and its laboratories are used for teaching purposes. As far as buildings and equipment are concerned, the laboratory department of the University would compare favorably with some A grade schools of America.

Near the University is Hope Hospital, or the city hospital. This hospital was erected and is supported by the city, but the patients are under the care of the staff of the medical school and are used for teaching purposes.

Very good clinical facilities are provided in this hospital. General medical and surgical clinics are held here. I had the privilege of attending some of these clinics and found them practical in character. Students are taken to the bedside and taught to examine the patients and make a diagnosis. There are also lecture rooms, with blackboards and charts, stereopticon, and other facilities for teaching, where lectures, both didactic and clinical, are given to the whole class and demonstrations held, but bedside ward teaching is a usual method. The Evangelismos, an unusually beautiful and well equipped general hospital is used for teaching purposes.

The Acretion Hospital provides for the clinical teaching of general surgery and gynecology. A number of clinics at this hospital were visited. The general operating clinics are held in two amphitheatres, and there are bedside clinics in the wards. The students are required to examine patients and to make dressings and to do minor operations. In adjoining grounds is the Agnition Hospital, which is devoted to neurology and mental diseases. These two hospitals are comparatively new and beautifully located with considerable ground surrounding them.

There is a special building for the treatment of diseases of children. A much larger, more complete, and better appointed children's hospital, consisting of four or five buildings, one of which contained an operating theater was in the course of construction at the outbreak of the war, and has since been completed. Much of the material for this hospital was brought from America. Near the University is a well appointed maternity hospital.

Ophthalmology, otology, and laryngology have a good building, well appointed and devoted to their special needs. These special hospital buildings are commodious, and the method of instruction seems practical and

efficient. The polyclinic located in the old section of the city has been entirely rebuilt on the American plan since the war and is accessible to the poorer population. Here there are several departments of medicine and surgery, which furnish facilities for practical instruction. It is mainly for out patients but it has a considerable number of beds. The dental school is in this building.

The Greek Red Cross has received a large fund from wealthy friends with which they have built a large new hospital on the American plan and with a training school for nurses conducted on the lines of our American training schools. This hospital has become a part of the University group.

Anyone studying the clinical teaching facilities of the medical school will be especially interested in the Syngros Hospital for venereal and skin diseases. This hospital was built, equipped and endowed by a wealthy Greek, Andrew Syngros and is in every way a model institution of its kind. In fact, it would be difficult to find a more perfect institution for the treatment and the teaching of these diseases. The active interest and enthusiasm of the directing physician, Dr. Photinos, keeps it abreast of the times, and he has developed the latest methods of giving instruction. An interesting feature of the management is that the female patients are practically prisoners in this hospital behind locked doors. The clinic here occupies an afternoon. One of the clinics attended was given over to a discussion of chancre. First the students studied the pathology in the laboratory. Here a number of microscopes with sections of tissue were in readiness for the microscopical examination. A description and pictures of the tissue were also provided. Features of the disease as relating to the specimen were discussed. In this way a variety of sections and a variety of descriptions were taken up and each

student had the opportunity of making the examinations under direction of an assistant.

On the other side of the same room was a line of male patients, each exhibiting his lesion, which had been previously cleansed, and an opportunity was given each student to examine these. In another room were ten or more female patients on high examining tables (the faces were covered) so that the students could easily and quickly examine the lesions.

A fair criticism of the medical school would be that on account of their traditions, their long existence under Turkish rule, and their far removal from the influence of Western civilization, their teaching is too largely theoretical and argumentative. While far seeing individuals of influence and ability, like Andrew Syngros, for example, have provided the medical school with laboratories and hospitals for a most complete and practical medical school, the average professor could improve his course by the introduction of more practical methods. The large group of buildings devoted to the interests of medical education attest the fact that a very practical and strong effort has been made and is still in progress in Greece to make the medical school a practical working school for the education of doctors thoroughly qualified to care for the sick. While the department has defects and deficiencies, certainly its well organized faculty, well developed program, and its group of buildings and hospitals devoted to medical education would be a credit to any city or country. After visiting a large number of their clinics and laboratory demonstrations and watching their practical work, the American observer is easily convinced that the great need is an infusion of British and American methods and ideals. Much of the new hospital equipment since the war has come from America.

A new University with a complete medical school is projected at Salonika. Certain American interests are back of this movement and much is expected of it.

One of the great calamities of the Smyrna affair was the destruction of the new medical school in that city. A wealthy Greek had spent about six million dollars on this project. A large amount of equipment was in the harbor on board ship at the time and was dumped into the sea by the Turks. It is understood that the institution is a complete loss.

In conclusion, I would suggest that surgeons visiting the Near East interest themselves in medical education in Greece. They need the aid and sympathy of the profession in Great Britain and America and will greatly appreciate our interest.

CARL E. BLACK

LOCAL ANÆSTHESIA

THE idea of performing painless operations on a conscious patient is probably as old as any other modern development. Yet the recent widespread use of local anæsthesia is based on the discovery of the anæsthetic properties of cocaine well known to Indian healers, its isolation from cocoa leaves and its first use in eye surgery by Koller in 1884. This date marks the beginning of rapid development, mainly in two directions. First the technique of local anæsthesia was evolved, step by step. Careful anatomical studies revealed exact landmarks for approaching nerve trunks. Methods of infiltration, peripheral and central nerve blocks, were described. Although some modifications may still be developed, practically all regions of the body have been thus explored. The development of the pharmacological side of the question has not been so rapid and is by no means complete. Yet important steps may be noted here. Cocaine,

except for surface anæsthesia, has been replaced by the much less toxic novocain. Small amounts of adrenalin have been added to slow down the rapid absorption of novocain and thereby prolong the duration of anæsthesia. Substitutes of novocain appear daily.

The object of further development would be to find a still less toxic and more active anæsthetic, that would alleviate postoperative pain for at least the first hours after operation, without causing any tissue irritation. Suggestive experiments have been made along this line.

Twenty years have elapsed since the appearance of the pioneer work of Heinrich Braun on local anæsthesia. It is instructive to watch the extent of these methods in various surgical institutions. At the University of Heidelberg the percentage of major operations performed under local anæsthesia rose from 11.4 per cent in 1906 to 54.2 per cent in 1911. H. Braun's clinic in Zwickau shows a rise from 24.8 per cent in 1908 to 50.5 per cent in 1913. The highest percentage of local anæsthesias was published in 1914 from the First Surgical Clinic of Budapest with 95.11 per cent. Ten years later in 1924 the curve of this same institution dropped to 64 per cent.

If the patient's age, psychic state, in addition to the absence of localized or generalized infection permit us to use a safe and technically simple method of infiltration or nerve block, then local anæsthesia becomes the method of choice in operations on the head, neck, chest, upper extremity, and lower pelvic organs. Bruin operations are done with remarkable ease under local anæsthesia, but unconscious and restless patients should be excluded. Blocking the trigeminal branches is a safe and sure procedure. In doing thyroidectomies or removing cervical lymph nodes perfect anæsthetization can be secured.

without the necessity of deep paravertebral injections. The segmentary innervation of the thorax renders chest operations a favorable field for intercostal anesthesia. Paravertebral injections are not without danger because of the proximity of pleura and spinal canal. They can be perfectly substituted by intercostal block or if a block of communication is necessary, by splanchnic anesthesia. The upper extremity is safely blocked at the brachial plexus and also further peripherally around the wrist or at the base of the fingers. Sacral transsacral or parasacral blocks will take care of floor of pelvis, bladder, prostate, perineum, and rectum.

As to abdominal operations in my limited experience the following procedure has proved to be most successful. If the operation is short whether the patient is young or an adult general anesthesia is the method of choice especially if general abdominal exploration is planned. This can be combined to great advantage with an abdominal wall block which if well done not only anesthetizes the incision but relaxes the abdominal wall. About five sixths to nine tenths of the general anesthetic is saved this way. A light gas or ethylene anesthesia is sufficient for the intra abdominal manipulations and the relaxation is obtained by local anesthesia. In well localized circumscribed lesions if the patient is above fifty or otherwise handicapped and the operation is going to be a long one, splanchnic anesthesia gives better end results. The infiltration of the prevertebral tissue in the height of first lumbar vertebra performed through open abdomen (Braun) has several advantages over posterior route. Gastrectomy for penetrating ulcer or carcinoma, common duct stone in a deeply jaundiced patient are the most frequent indications.

Another questionable point is the anesthesia of the lower extremity. Spinal anes-

thesia, if done at all, should be limited to this region and not attempted above the umbilicus. In patients above forty, especially if marked organic lesions are present, spinal anesthesia still maintains its place and ought not to be entirely discarded. The absence of shock in handling nerve trunks as in amputation of the femur or in sciatic suture is very remarkable when spinal anesthesia is used. Otherwise local field blocks or light general anesthesia in cases in which deep relaxation is not necessary are equally satisfactory.

The diminution of postoperative pulmonary complications, the absence of heart, liver, and kidney damage, the diminution of gastrointestinal and bladder paralysis and the possible co operation of the patient can be mentioned as advantages of local anesthesia.

The relationship between local and general anesthesia is not that of rivalry. Both local and general have their advantages in certain types of patients and certain regions of the body. They can also be combined to a great advantage, especially in abdominal surgery. However, there is one great difference between the administration of the two methods. The general anesthetist whether a specialist or a well trained nurse, is entirely separated from the operation itself. The less he is interested in the procedure, the more attention he will give to the narcosis. Local anesthesia should be given by the surgeon himself or his first assistant. It is a part of his technique, it should be part of his surgical training. It should be taught in the medical school, in anatomy, in dispensary clinics and chiefly during postgraduate work. There is no need then to make a specialty out of local anesthesia. The surgical specialists can quickly adopt simple methods peculiar to his particular field. The growing importance of these methods should be recognized but not overestimated.

G DE TAKATS



JOHN P. MITTAUE
1787-1875

MASTER SURGEONS OF AMERICA

JOHN PETER METTAUER

ACCOMPANYING Lafayette's American expedition was a young French surgeon Francis Joseph Mettauer. After the battle of Yorktown, the young surgeon, at the solicitation of General Lawson, the Randolphs, and the Henrys, was persuaded to remain in the new country and settled in Prince Edward County, Virginia, where, soon afterward, he married Elizabeth Gaulding. In 1787, a son, John Peter Mettauer, was born to the couple. Apparently, the youth early decided to follow his father's profession, in 1806, at the age of nineteen, he received the A. B. degree from the neighboring college of Hampden-Sydney, in 1809, he graduated from the medical department of the University of Pennsylvania. At Pennsylvania, young Mettauer was particularly fortunate in coming under the influence of such men as Shippen, Wistar, Physick, and Rush that he profited by his opportunities and his early manifested ability is evidenced by the expressed opinion of his preceptors.

On receiving his medical degree, Mettauer returned to his native state, settling in Prince Edward County near Farmville, Virginia, with the resolution "Though doomed to labor in the country as a practitioner to continue my studious habits." His skill seems to have won immediate recognition, he found himself engaged in a busy practice without the necessity of passing through the probationary period which is the lot of the modern medical graduate. With the passage of years, his work became more restricted to surgery, though he always resented the insinuation that he was a "specialist." His surgical skill was so remarkable and the success that followed his efforts was so striking that patients came to him from far and wide, from the most remote regions of America and even from abroad. At the height of his career, it was no unusual thing for him to have as many as sixty patients under his care at one time, and every suitable house in his neighborhood is said to have sheltered at least one patient convalescing from an operation or one awaiting his turn at the master's hands. It is a matter of record that Mettauer operated 800 times for cataract, the number of such operations probably was in excess of this, he operated for stricture over 200 times, and Dudley's record of "cutting for stone" 225 times is eclipsed by Mettauer's 400 similar operations.

Mettauer's operations were characterized not only by skill but by daring and originality. He was undoubtedly the first western surgeon to operate for cleft

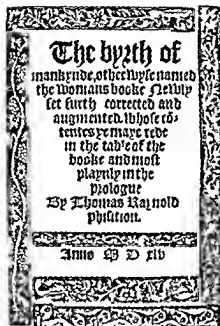
palate, using for this purpose, an instrument devised by himself. He was certainly among the first to undertake such operations as amputation of the shoulder, ligation of the carotid and resection of the superior maxilla. Though such ability to occupy the forefront of his profession through his early employment of the suggestions of his contemporaries stamps Mettauer as an unusual man, probably his greatest claim to fame rests upon his being the first surgeon successfully to operate for vesicovaginal fistula. Though Sims is generally credited with the honor of introducing the operation for the alleviation of this distressing condition Mettauer described the procedure in the *Boston Medical and Surgical Journal*, vol. xvi page 154 twelve years before Sims first conceived the idea, and five years before Sims first discussed the operation for vesicovaginal fistula, Mettauer wrote in the *American Journal of the Medical Sciences* new series, vol. xiv, p. 117 "I am decidedly of the opinion that every case of vesicovaginal fistula can be cured and my success justifies this statement."

In spite of the enormous volume of his operative work Mettauer found time for other things. He was a prolific writer, literally hundreds of articles, not only on surgical topics but on such subjects as yellow fever, puerperal fever and Asiatic cholera are to be found under his name in the leading medical journals of his day. There is still in existence the manuscript of his treatise on surgery, never published, for some unknown reason. This treatise comprises some three thousand pages of closely written legal cap, and can well stand as a model, both for accuracy of analysis and excellence of phrasing. In 1837 he opened a medical 'institute' being impelled to this step by the paucity of medical schools in the United States at that time. His institute continued in successful operation, at first independently later as a part of Randolph Macon College until 1848.

Mettauer lived to the advanced age of eighty eight years. Apparently, the infirmities of age had little affected him, in the last week of his life, his eye was sufficiently keen his hand retained the requisite steadiness and his judgment was reliable enough for the successful performance of an operation for cataract, a second for stone and a third for amputation of the breast. Just after these as a result of exposure incident to attending a patient suffering from opium poisoning he contracted pneumonia, and this "friend of the aged" caused death in two days.

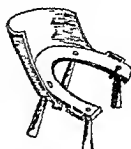
The clinic of this remarkable man of the 19th Century seems to have as its only parallel in this the 20th Century (certainly in the western world), the Mayo Clinic of Rochester Minnesota. The life and achievements of this pre Listerian surgeon stamp him as among the leaders of his profession. Few surgeons surpassed him in daring and originality he was among the foremost educators of his day, and his contributions to medical literature alone should have saved his name from oblivion. In spite of this, Mettauer is unmentioned by many medical biographers, while those who refer to his work do so in a very casual manner. *Sic transit gloria mundi*

A. MURAT WILLIS



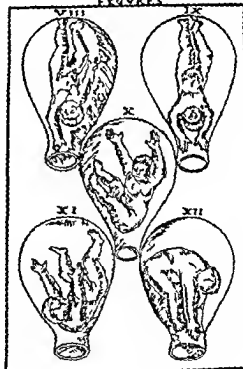
THE BIRTH FIGURES

THE WOMAN STO LE



THE BIRTH

FIGURES



THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED J. BROWN, M.D. F.A.C.S., OMAHA

THE BIRTH OF MANKYNDE

IN spite of the fact that the minds of the English people had been centered on the desire for an heir to the British throne since the early years of the sixteenth century and this same desire must have been present in the medical profession as well as the laity, no strictly medical attention had been paid to the science of obstetrics. A fifteenth century manuscript exists in the British Museum but so far as known had never been printed. It is interesting to follow the story of Henry the Eighth and speculate on the origin of the most famous work on obstetrics in the English language which held its pre-eminence for over one hundred and thirty years.

Henry the eighth, he of the many wives, in the early part of his reign married his brother's widow Catherine of Aragon. Their child was a girl the Lady Mary and after the king despaired of a male heir he finally divorced Catherine and in 1533 married Anne Boleyn. This marriage failed to produce a male heir and in 1536, after a trial in which Anne was found guilty of adultery, she was condemned to death and beheaded. The following day Henry married Jane Seymour who in 1537 gave birth to Edward the Sixth. There was great rejoicing that after a wait of twenty-eight years an heir to the throne had arrived but there was subsequent sorrow when twelve days later, the queen who had produced this heir, died of puerperal fever. Did this series of events turn the minds of British medical men to the necessity of the study of obstetrics? For it was but three years later that the "Byrth of Mankynde" first appeared.

As this question of the origin of the book is but a speculation so there is a mystery in the book itself. Its author is not known definitely and there is little ground for disagreement as to the printer. The first edition appeared in 1540 and was a translation into English of the Latin form of "Roesslin's Rose garden" (1513) which appeared under the title

"De Partu Hominis." The claim to this English translation is made by one Richard Jonas and it was printed by one T. R. who was probably Thomas Raynalde, a well known printer of the sixteenth century who dwelt in St. Andrew's Parish, in the Wardrop, and kept shop in St. Paul's churchyard. To this edition Thomas Raynalde the physician, had no claim for it is very doubtful if Thomas Raynalde the printer, and Thomas Raynalde the physician were the same. In the second edition that of

1545,¹ Richard Jonas drops out of the picture except for anonymous mention in the prologue and Thomas Raynalde's position whose name appears on the title page as the author, enters. He claims no originality for the book for in the prologue he says "wherefore now to come to oure purpose ye shall understande that although a thre of foure years passyd a certayne studious and diligent clarke, at the request and desyre of dyvers honest and sadde matrones beyng of his acquayntance, did translate out of Latin in to Englysshe a greate part of his hooke entytlinge it accordyng to the Latine inscription (de partu hominis) that is to say of the byrth of mankynde" which we do now name the "The wommans booke". He states that this translation did not vary from the original Latin but that he, Raynalde, was changing it somewhat. The changes appear to be mostly in the anatomy which appears to follow that of Vesalius whose "De corporis humani fabrica" 1543, was in direct contradiction to the then prevailing Galenic anatomy. In the table of the first book he refers to eleven anatomical figures which are copper plates that follow the Vesalian anatomy. The other illustrations are copper plates depicting the "woman's stoole" or obstetrical chair and the seventeen "birth figures" which follow Roesslin very closely and, like the text, were probably copied from his Rose garden. Roesslin in turn, had obtained them from one of the early manuscript copies of the obstetrical work of Soranus of Ephesus who lived in the second century A.D. This work had been passed down through the centuries by means of the various Soranus-Moschion codices and was the authoritative work on obstetrics up to the appearance of the Rose garden. These copper plates are poorly executed and are not by the same engraver as the "Geminus" plates. However, as they appeared in the Jonas edition of 1540 they have the distinction of being the first copper plates printed in England.

The book is printed throughout in black letter and contains 149 pages. In addition to the anatomy and description of positions of the fetus and the care of labor it contains many recipes and directions for the cure of various complaints scattered through it, among others "to keepe and preserve the teath cleane", "Of stylynge breath," etc.

Written rather for the laity and midwives than for the medical profession the book was reprinted often, and the final edition appeared in 1676.

¹ Courtesy of Dr. LeRoy Crummer, Omaha, Nebraska.

REVIEWS OF NEW BOOKS IN SURGERY

IN the Goulstonian Lectures by Ryle¹ which appear as a monograph an attempt is made to clarify the subject of gastric function and responses. The text is divided into three parts covering normal gastric responses, gastric responses in disease, and the classification and symptomatology of the common dyspepsias. The author advances a number of conclusions which are hypothetical deductions made from clinical and laboratory observations on man but not proved by animal experiments.

J A WOLFER

MILLS, in his recent monograph on cancer of the rectum² presents this vital subject in a most interesting and logical manner. Perhaps no surgeon of today has had a greater experience in treating cancer of the rectum and I would judge from a careful reading of this little book that no surgeon has studied this subject with a clearer conception of cancer in general and cancer of the rectum in particular. The work is profusely illustrated. The symptoms and pathological classification are discussed in a lucid manner. The most interesting and instructive part of this little monograph is that dealing with the surgical treatment. The author from his personal experience and study has gradually evolved an operative technique based on a knowledge of the demonstrable facts of pathology and he performs the most extensive operation possible in conformity with that knowledge in all cases, no matter how small or early the local manifestation of the disease may seem to be.

J A WOLFER

A SPLENDIDLY written small volume on surgery³ from the pen of the master surgeon Rutherford Morrison is intended for the general practitioner. The author's premise is that 'the fate of a patient the victim of an abdominal emergency depends chiefly upon the skill and promptitude of his doctor rather than upon special surgical skill. The subject matter is treated under three headings: abdominal emergencies, subacute abdominal diseases, and chronic abdominal diseases. Well selected case histories cited from the author's rich experience help to emphasize salient points in diagnosis.

GEORGE HALLERIN

A VOLUME entitled *The Melanomata*⁴ presents the results of (1) an intensive histological study of cell

¹GASTRIC FUNCTION IN HEALTH AND DISEASE. By J. H. A. Ryle M.D. (Lo. d.) F.R.C.P. New York Oxford University Press 1938.

²CANCER OF THE RECTUM. Being the Goulston Lectures delivered before the Medical Society of London, 1937. By W. Ernest Mills F.R.C.S. London H. K. Lewis Ltd 1938.

³ABDOMINAL AND PELVIC SURGERY FOR PRACTITIONERS. By R. Morrison. New York Oxford University Press 1935.

⁴THE MELANOMATA. THEIR MORPHOLOGY AND HISTOGENESIS. A STUDY OF CELL ORIGIN AND TRANSFORMATION WITH A CLINICAL DISCUSSION ON ASPECTS OF TUMOR GROWTH AND A CLINICAL REVIEW. By James W. Dawson M.D. D.Sc. F.R.C.I.T. Edinburgh and London Oliver and Boyd 1935.

origins and transformations made with the hope of throwing light upon the diagnosis of numerous growths of atypical melanomata so that the earliest malignant changes may be recognized. (2) a review of the clinical course and manifestations of an extensive series of benign and malignant melanomata with the formulation of clinical deductions, and (3) a critical discussion of certain aspects of the histological and etiological phases of tumor growth. It is based upon an examination of 157 melanomata from human sources and a smaller number of similar tumors from the calf, sheep and horse, together with a study of the presence and formation of melanin in various locations in man and animals where it is normally found.

The author is convinced that the formation of melanin is a specific function of the cells of the basal layer of the rete malpighii of the skin. These cells the melanoblasts maintain throughout their existence the function of producing pigment and they transmit this characteristic to their descendants. The melanophores or chromatophores found in the corium merely transport pigment but do not produce it.

Dawson thus adopts the view of Unna and others that the simple melanomata have their origin in early life or at puberty in the basal cells of the surface epithelium or rete epithelial processes. These basal cells losing their essential epithelial morphological characters migrate into the corium where they maintain their capacity to produce melanin and become nevus cells. These cells differ therefore from the chromatophores of mesodermal origin from which Köhler in 1860 and later Kibbert derived the melanomata. The malignant melanomata usually have their origin in a benign pigmented nevus. The tumor cells arise from two sources: (1) from a proliferation of the original nevus cells embedded in the corium, and (2) from cells of the surface epithelium and its interpapillary epithelial processes by a series of transformations analogous to those traced in the genesis of a simple nevus.

On clinical grounds Dawson divides the melanomata into

- I Cutaneous melanomata (139 cases)
 - 1 Benign melanomata
 - (a) Nevus celled type (29 cases)
 - (b) Acanthotic type or pigmented warts (37 cases)
 - 2 Benign melanomata showing increase in size (6 cases)
 - 3 Melanomata showing definite transitions to malignancy (36 cases)
 - 4 Malignant melanomata with gland involvement (37 cases)
- II Ocular melanomata (18 cases)

This book is exceptionally well illustrated. Seven pages of bibliography with complete titles and references add much to its value. The author is never

dogmatic. He presents his observations and the deductions therefrom with clearness and directness. The attempt to correlate the clinical data and histological findings is thoroughly critical and illustrates the difficulties of such a procedure. Many other important phases of melanomata and melanias for mention are discussed but cannot be even mentioned here. This volume is an interesting contribution to the subject.

J. P. SUGRVS

CURRENT medical literature has supplied many contributions to the surgical aspect of colonic and rectal tumors but no monographs since Harrison Cripps so adequately illustrates the pathology of the disease as the one by Lynch and Felsen.¹ Full page illustrations showing gross specimens with inserts of the histopathology are faced on opposite pages by a brief clinical history of the disease and a pathological description of the specimen. This management of the material is much like that employed by Mr. Choyce in his surgical library, where the gross specimens are flanked by the microscopic slides and the clinical history of the patient while the literature of the subject is on the shelves close by. An atlas of the pathology of the cancer of the large bowel is in this way developed. The interspersed text includes a complete survey of the lymphatic drainage of the large bowel and emphasizes its importance in the radical surgical removal of cancer of the large bowel. The chapter on embryology, anatomy and physiology is brief but adequate.

Perhaps no subject in surgery presents more points of controversy than the treatment of carcinoma of the rectum. No standard procedure exists. Criticism of the authors' views would therefore be only in the nature of an argument. Preservation of the anal sphincter and re-establishment of continuity of the bowel after radical removal of cancer of the rectum are not, however, generally accepted principles of surgical procedure.

This monograph is a valuable contribution to the subject and because of the emphasis placed on the pathology and anatomical features of the subject, the book will lead to earlier diagnosis and a clearer understanding of the principles underlying the treatment of cancer of the large bowel.

VERNON C. DAVID

ANEW work has appeared on chronic pancreatitis with jaundice.² The condition is treated as a definite syndrome from the ill classified lesions of the gland. Following a thorough review of previous reports on this condition, Mallet-Guy carefully describes the different anatomical and histological forms which he considers of great importance in a diagnosis at operation.

¹ *TUMORS OF THE COLON AND RECTUM. THEIR PATHOLOGY, DIAGNOSIS AND TREATMENT.* By Jerome M. Lynch M.D. and Joseph Felsen M.D. New York Paul Hoeber 1925.

² *PANCRATITES CHRONIQUES AVEC ICTERE (CAUSES, DIAGNOSTIC ET TRAITEMENT).* VALLET ET RESULTATS ELONGUES DE LA CHOLECYSTOGASTROSTOMIE. Préface de M. le Professeur Berard. By Dr. Pierre Mallet-Guy. Paris Masson et Cie 1925.

The well known causes of chronic pancreatitis with jaundice such as cholecystitis with or without stone which may have been passed and the various infections of the biliary tract apparently do not explain all the cases of this character which present important pathogenic problems.

The author's clinical observations are quite convincing. They are followed by diagnosis and a discussion of the treatment. Stress is laid on the necessity of biliary drainage, the value of cholecystostomy and other operations on the gall tracts which permit drainage to the outside or to the alimentary tract or through the ampulla.

Favorable final results of cholecystogastrotomy are reported in 9 cases checked by means of the duodenal tube and X ray with barium. The roentgenograms show plainly the bile excretion from the fundus of the gall bladder where it is attached to the lesser curvature of the stomach proximal to the pylorus.

In the main the author favors the use of cholecystostomy not only as a therapeutic measure but as a method of confirming the diagnosis of chronic pancreatitis. The monograph conveys an impression of careful work and is a noteworthy addition to our clinical knowledge of chronic pancreatitis.

KELLOGG SPEED

FROM the anticancer center at Villejuif comes a monograph on the radium cure of cancer³ with the admission that in spite of our rapid progress in this therapy it is still not easy to formulate exact rules and laws for the treatment of cancer by radium.

In the first part the physical properties of radioactive substances and radium in particular are covered. There follows a chapter on the pathological anatomy of cancer, especially in regard to the cellular reaction to radium. A brief description of clinical diagnosis of all forms of cancerous growths ends the second part. In the third part, the modern ideas on the radiosensibility of the various body tissues are well covered. The fourth part deals with the methods of application of radium and treatment in general with this agent. This part is illustrated by photographs of patients suffering mostly from epithelioma of the skin but explains with case illustrations and autopsy findings the value of radium therapy in all forms of malignant growths.

The monograph consequently offers the theoretical, biological action, and practical employment of radium for cancer and thus presents the physician and surgeon with a valuable ready reference.

KELLOGG SPEED

THE value of one man's experience is enhanced by the written record of his observations. In a monograph which has recently appeared on the diagnosis and treatment of tuberculosis of the hip,⁴

³ *LA CURA RADIIQUE DES CANCERS.* By Simone Laborde. Paris Masson et Cie 1925.

⁴ *THE DIAGNOSIS AND TREATMENT OF TUBERCULOSIS OF THE HIP.* By G. R. Gardeslone B.M. (Oxon.) F.R.C.S. New York Oxford University Press 1925.

Girdlestone reflects valuable experience. The book is enriched by selected illustrations and should be read by every medical man because the early recognition of this deadly and deforming disease renders it amenable to curative treatment.

The author's easy style, his classification and his logical discussion of treatment make an excellent epitome of the subject.

KELLOGG SPEED

TOO infrequently the Medical Society caters to the classical paper. A noteworthy exception exists in the Wayne County Medical Society (Detroit) which by the terms of the Detroit Orthopaedic Lectureship Fund distributes its first lecture. The Evolution of Orthopaedic Surgery.⁴

This small monograph is a classic and will be thankfully received by all libraries, publications and societies. The orthopaedic student must turn to it for a resume of the history and progenitors of his chosen work.

KELLOGG SPEED

THE monograph by Orr dealing with modern methods of amputation⁵ is a very concise outline of the general principles of this branch of surgery. The author makes no pretense of establishing any original methods. He has confined his discussion to those methods that are practical and workable. Thoughtfulness is shown in his omission of

many of the obsolete and fantastic operative procedures that clutter up the pages of most surgical textbooks. There is little to criticize and much to commend in this very brief work. More monographs of this type would greatly facilitate the work of the occasional operator by emphasizing important points and not confusing the reader with too much detail.

R. W. McNEALY

DR FISHER⁶ presents to the medical profession a discussion of the importance and value of manipulative surgery in the treatment of carefully selected cases of certain sequelae of injuries and diseased joints, muscles, tendons and fascia. He states that failure of the profession to grasp the truth of these statements causes the public to flock to bone setters and other uneducated members of cults. He recognizes the honest men who have tried to place this therapeutic measure on a scientific basis and devotes brief space to the historical circumstances which led to the treatment of these conditions by prolonged rest.

A brief description of the surgical anatomy and the normal movements and range precedes the technique of the manipulation of each joint.

Emphasis is placed on the importance of early movement and massage following the injury or following manipulation under anesthesia in neglected cases for the prevention of adhesions.

MANIPULATIVE SURGERY: PRINCIPLES AND PRACTICE. By A. G. TUNNICLIFFE, M.D., F.R.C.S. (Edg.) New York: The Medical Book Company, 1926.

THE EVOLUTION OF ORTHOPAEDIC SURGERY. By R. LESTER BAYLY, M.D., St. Louis: The C. V. Mosby Co., 1925.
MODERN METHODS OF AMPUTATION. By THOMAS G. ORR, M.D., St. Louis: The C. V. Mosby Co., 1926.



John B. Murphy

AMERICAN COLLEGE OF SURGEONS

DEDICATION AND INAUGURATION OF THE JOHN B MURPHY MEMORIAL

THE completion of the Murphy Memorial marks an epoch in the history of the American College of Surgeons. Two evenings, June 10 and 11, were occupied with its dedication and inauguration. The first evening was under the supervision of the John B. Murphy Memorial Association, with Mr. Leroy A. Goddard, the president of the association, as presiding officer. The ceremony was begun by a procession to the platform of officers of the Murphy Memorial Association and the American College of Surgeons and distinguished guests, preceded by the bearer of the Mace, symbol of authority of the College. Following the playing of the national anthem, the invocation was pronounced by the Reverend William H. Agnew, S. J., president of Loyola University, as follows:

"Almighty and Everlasting God, Omnipotent Author and Benignant Owner of the universe, recognizable as such with scientific certainty by the human intellect that fairly views the world and honestly traces back phenomena to their adequate and ultimate origins, we are assembled here this evening to dedicate to the service of humanity a new instrumentality of mercy and enlightenment in memory of one who always believed in Thee, and worked always in Thy Holy Name. Grant that those who are to administer this noble institute may always reckon themselves as the stewards and dispensers of Thy bounty and the responsible agents of Thy mercy. Grant that those who will study and labor within these walls for the betterment of human kind may always be mindful of Thy warning and Thy charge: 'Whatsoever you do to the least of my brethren, you do to me.' Likewise we pray Thee, give to those who will write and deliberate within these halls the gifts of wisdom, sure knowledge, honesty and loyalty, wisdom, knowledge, honesty and loyalty that will make them the beneficent dispensers of truth and the safe guides of genuine research, and that will save them from the blasphemous

stupidity of invoking the very evidences of Thy handiwork in disproof of Thy existence and in destruction of man's highest dignity and supremest hope, which are that we are Thy children and the heirs of an eternal destiny. Amen."

The John B. Murphy Memorial building was formally presented to the American College of Surgeons by the president of the Murphy Memorial Association and was accepted in behalf of the College by its president, Dr. Rudolph Matas.¹

Because of the fame of Doctor Murphy and the recognition of the importance of the work being carried on by the College, of which Doctor Murphy was a founder and Regent, the civic and educational organizations in the city of Chicago were represented, and there were present to participate in the ceremony many famous surgeons of the United States and Canada. To those who co-operated in making possible the Murphy Memorial, the presiding officer expressed the appreciation of the Memorial Association as follows:

"Before introducing the speaker of the evening I desire to give expression of our appreciation to the many units that have co-operated with us for the success of these exercises. We have here representatives from the following educational institutions: Northwestern University, University of Wisconsin, University of Illinois, Notre Dame University, University of Michigan, University of Chicago, and St. Ignatius College. Doctor Murphy was directly associated with or received honors from all these institutions. We are honored by representatives from the State, County and City Governments. We appreciate especially the presence of so many of the County Commissioners, and several of the members of the Mayor's cabinet. In this connection I mention also with much pleasure the following clubs of Chicago: Chicago, Chicago Woman's, City, Fortnightly, Industrial, Kiwanis, Rotary and the Union League. The last named Club appointed fifty three

¹Addresses appear in full in following pages

delegates and its president Harry Eugene Kelly is attorney for the Chicago Medical Society. The Chicago Association of Commerce one of our most influential supporters appointed thirty four delegates. Its president, Mr William R Dawes one of the busiest of business men is here heading this delegation. It has a companion in the Illinois Manufacturers Association, whose long time secretary and successful pusher Mr John M Glenn is here with its representatives. Mr Glenn has proved one of the most useful members of the executive board of our association. I mention also the presence of representatives from the Chicago Bar Association and the Ohio Society. Time will not permit more than the mere mention though just as important and just as fully appreciated that we are favored with delegates from ten medical societies and from all the leading hospitals in Chicago.

In introducing Dr William J Mayo the principal speaker of the evening the President said:

I know it is a delight to you all to have this opportunity to listen to one of the most interesting men of this period and one whose name and reputation are internationally known. Many of us heard the splendid address that he delivered at the laying of the cornerstone of this building. He has graciously favored us again with his presence. I present our neighbor from the West the distinguished surgeon Dr William J Mayo of Rochester Minnesota.

Dr Mayo spoke on 'The John B Murphy Memorial the Atheneum of Surgery.'

The ceremony was brought to a close by the playing of the Star Spangled Banner, and an informal reception for the audience among whom were the daughters of Doctor Murphy.

THE inauguration of the Memorial by the American College of Surgeons took place on the second evening Friday June 11, with the president of the College Dr Rudolph Matas, as the presiding officer. A formal procession of the officers of the Memorial Association and the College distinguished guests and Fellows of the College in the academic gown and cap, headed by the Mace bearer in the uniform of the United States Army, opened the meeting. The orchestra rendered the national anthem whereupon the following invocation was pronounced by the Reverend Duncan H Browne STD rector of St James Church:

"In Thy presence our Father we stand tonight to dedicate this temple to the pursuits of scientific research in medicine and surgery. The building bears the name of one who gave himself without stint to the service of mankind—John Benjamin Murphy—devoted husband and father—faithful friend—loyal and patriotic citizen—a teacher with a keen insight into the truth—a skillful minister to the relief of the diseases and ailments of human kind.

'May this building ever stand as the symbol of all that is best and noblest in the practice and profession of medicine and surgery.' May it inspire to break down prejudice and ignorance by the clear rays of truth and knowledge. May its ideal to serve God and minister to the needs of humanity ever remain the foundation stone upon which it is built and its ideals maintained. In that light shall we see light. In so dedicating this temple of light we bespeak the divine guidance and the blessing of Him who taught that inasmuch as we do it unto those least we do it unto Him—our Lord and our Saviour Jesus Christ Amen.

The President's introductory remarks follow:

The Fellows of the American College of Surgeons who represent the thought and aspirations of the surgeons of America have assembled here tonight to voice through the utterances of their most distinguished leaders the sentiments of gratitude that animate the College in accepting the noble edifice that the relatives friends and admiring colleagues of Doctor Murphy have dedicated to his memory and to the service of surgery.

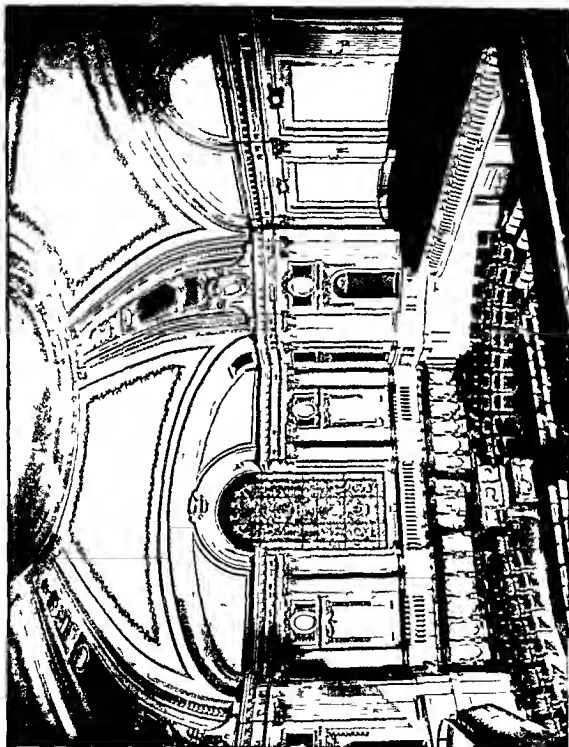
In grateful recognition of the generous motives that have prompted the John B Murphy Memorial Association to transfer this monumental testimonial of their love and admiration for the great surgeon whose name it bears to the permanent care and custody of the American College of Surgeons the College will now celebrate the first public session held under its auspices in this memorial hall. Availing themselves of this memorable opportunity the speakers who will address you will confirm their faith in the purposes and ideals of the College and renew fidelity to its pledges and to the fulfillment of its obligations.

Doctor Murphy's life and labors in their relation to the American College of Surgeons and to the progress of the science and art of surgery as developed in America, have been

¹Addresses appear in full in following pages



John B. Murphy Memorial



Interior of Au lito sum 'Shing, Stained Glass Window

told in a way that is too fresh in your memory of last evening's proceedings to require, at this moment, more than an added word to emphasize the service that he rendered in evaluating and glorifying surgery by his teachings and example. It is in the prosecution of his high aims and ideals through the instrumentality of this priceless possession that the College will render the most faithful tribute to his memory.

"It is to the further expansion of the altruistic purposes of this organization in serving the highest interests of humanity through the ever growing, ever changing, ever advancing, and ever conquering forces of modern scientific medicine, that the proceedings of this session will be formally consecrated.

"In calling for the first number on the program we are happy to recall that there is no one in our guild who lived closer to the thoughts of the great master and who sympathized more responsively to the noble spirit that animated him or who promoted and gave form to his aspirations and ideals, than the friend and colleague whose genius for organization and leadership has given life and movement to the great enterprise that we now visualize in the mission and functions of the American College of Surgeons. To renew the pleasure that it gives us to acknowledge the unpayable debt that we owe to the originator and organizer of our association, I am now happy to present the Commanding General of our Army as the best fitted to initiate the proceedings of the evening,—
Dr Franklin H. Martin."

Dr Martin spoke on "John Benjamin Murphy—Citizen and Surgeon."

Dr George W. Crile, of Cleveland, whose subject was "The American College of Surgeons" was introduced by the President who said:

"Throughout the fourteen years that have elapsed since the foundation of the American College of Surgeons, a great surgeon and a great personality in American surgery has stood by the helm of this institution and brought to bear upon its administration all the light that his gifted intelligence and the incalculable wealth of his scientific knowledge could give to the guidance and support of its aims and functions. I have the honor to present to you one of the greatest assets of the American College of Surgeons and one of the outstanding, most original and prolific contributors to the progress and prestige of

American surgery—Dr George W. Crile."

At this stage, the proceedings were agreeably interrupted by the entrance of Dr Charles H. Mayo whose presence on the platform was the signal for a general outburst of applause. After responding in fitting terms to the warm welcome accorded him, Dr Mayo proceeded, in behalf of the College, to present to Mr Walter E. Carr a specially designed and engraved testimonial in parchment, attesting to the thanks and grateful appreciation of the College for his invaluable service in financing and erecting the Murphy Memorial. Mr Carr did not spare time, thought, or labor in completing his task but worked with zeal and enthusiasm solely for the love of the cause and without thought of pecuniary compensation. Dr Mayo's remarks follow:

"My present task is a most agreeable one. While we are here assembled to dedicate this beautiful memorial building erected to the memory of that great surgeon and teacher, John B. Murphy for the advancement of medical science, it is most fitting that we, at this time, acknowledge the work of Mr Walter E. Carr in making our vision come true. The members of the Board of Regents, now that the construction details are over, appreciate the magnitude of the work and the importance of the detail which was the burden of Mr Carr rather than the Board. We have appreciated his contagious optimism and enthusiasm at all times no matter how arduous were his duties.

"I now present to Mr Carr on behalf of the members of the Board of Regents this record of their appreciation which states:

TO WALTER E. CARR

in recognition of his unselfish devotion, his persistent endeavor and his untiring service in aiding and establishing the monumental

JOHN B. MURPHY MEMORIAL BUILDING

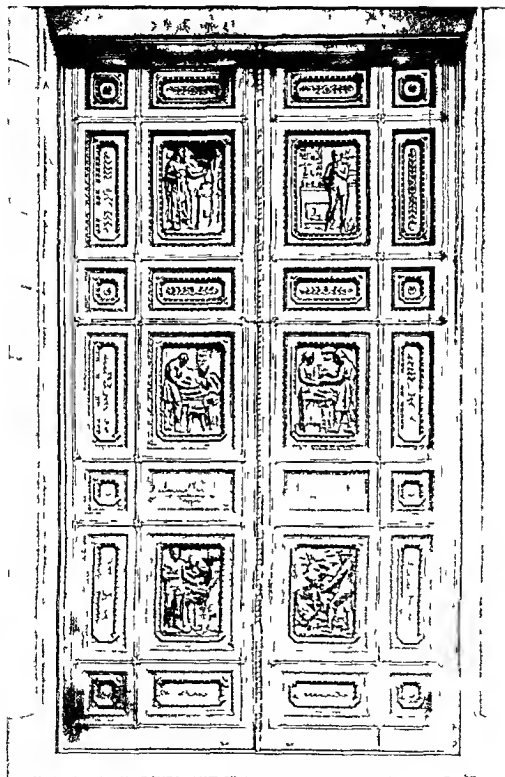
which commemorates one of the world's greatest surgeons. The Board of Regents of the American College of Surgeons has delegated us to express the thanks of the College and has authorized us to place upon the walls of the Murphy Memorial a tablet attesting for all time this appreciation. In witness whereof we have caused the Common Seal of the American College of Surgeons to be hereunto affixed this tenth day of June, Nineteen Hundred and Twenty-six.

(signed) RUDOLPH MATAS, President

(signed) FRANKLIN H. MARTIN, Director General

In responding Mr Carr said:

"I can assure you it is not necessary for me to state that I am taken entirely by surprise, but I most deeply appreciate the great



Dr Norman Bridge Memorial Bronze Doors

honor that has been conferred upon me. And in your own more than kind words, Dr Mayo, you have not lived up to your reputation for conservatism, but have readily exaggerated whatever it may have been my good fortune to have accomplished in connection with the work to which you have referred. To be associated in any way with the very distinguished men who comprise the Board of Regents of the American College of Surgeons is an honor, a very unusual honor, and most especially for a business man. So far as the work is concerned, it was not difficult, but was a pleasure throughout on account of the object—a memorial to Dr John B. Murphy, and on account of the dignity of the work of the American College of Surgeons."

"Surgeons of America"¹ was the title of the presentation by Dr W. W. Chipman, of Montreal, president elect of the College, whose introduction by the President follows:

"One of the greatest aims of the American College of Surgeons has been to promote international relations and to foster the spirit of brotherhood among the men of our profession. From the very beginning of this institution it recognized no frontiers between the Dominion of Canada and the United States. The deeply rooted sympathies of race, language, and tradition have inseparably interlocked the professional interests of the Canadian profession and our own, and have fused these into a common mold. Ever since our foundation, the surgeons of Canada and of this country have moved together as a solid phalanx in the most perfect unity of purpose, sentiment, and action. Our administrative and executive offices are shared alike in a common Fellowship, and we glory in the achievements of the great Canadian leaders who have contributed so largely, so freely and so effectively, to the cause of our organization. Of this number, no one is better fitted to represent the loyalty and the service of the Canadian profession in aiding this College to the attainment of its mission than the distinguished leader, now our president elect, whom I have the honor to present—Dr Walter W. Chipman, of Montreal."

In presenting the last speaker of the evening the President said:

"If there is merit in a life of service devoted to the unalloyed love of his profession and to the promotion of every movement that

could tend to elevate and dignify it by the force of example, I know of none greater than the life and labors of the distinguished gentleman who is here as the representative of the medical culture of the greatest metropolis of the world. Thrice president of the New York Academy of Medicine, one of the ablest, most eloquent, and most inspiring masters of that center of medical learning—a plumed knight of our profession and one of the best loved members of our guild—Dr George David Stewart, of New York."

Dr Stewart spoke on "Three Decades in Surgery."

With the playing of the "Star Spangled Banner" and an informal reception, the ceremonies drew to a close.

DESCRIPTION OF THE MURPHY MEMORIAL BUILDING

The John B. Murphy Memorial Building is a monumental structure built of fireproof materials, faced with Bedford stone. It follows in design the French Renaissance period of architectural development and the exterior design was inspired by the Memorial Building in Paris. The building is set back somewhat from the street to set off the beautiful architectural motifs of the façade in the best way. The façade is featured by a pair of exceptionally designed and modeled bronze doors by Tiffany, presented by Mr. Edward L. Doheny as a tribute to Dr. Norman Bridge, who was a lifelong friend and a man of high repute in the medical profession. The bronze doors contain panels setting forth historic incidents and lives marking the various great steps of advancement in the history of medicine. These panels represent Æsculapius, the god of medicine, Pasteur, a founder of scientific medicine, Osler, a great clinician, Lister, the father of modern surgery, McDowell, an American pathfinder in surgery, Gorgas, a world sanitarian. These bronze doors are at the top of an imposing flight of double stairs leading to the main floor of the building.

The main floor is taken up with the Memorial Hall. This auditorium is also French Renaissance in architectural treatment and is exceptionally impressive in its proportions with its high vaulted and ornamented ceiling. The color scheme of the room is ivory accented with gold. Blue is used in the draperies, floor covering and upholstery. An outstanding feature in the auditorium is the memorial stained glass window, directly opposite the main entrance and back of the platform, donated by Mr. C. H. Matthiessen, and executed by the Willet Company, of Philadelphia. This

¹ Addresses appear in full in following pages

stained glass window ties in beautifully with the color scheme of the room and has the feature of the seal of the American College of Surgeons. Below the stained glass window, the stage is largely treated with carved walnut paneling of exceptional merit and incorporates the seats for the Board of Regents and their president. A pipe organ is now being installed in the Memorial Hall. The interior of this room has been designed with the thought in mind to arrange as many spaces as possible for the installation of memorial paintings, tablets, busts, statues, etc. and still in no way to interfere with the impressive architectural treatment of the room. The main floor and balcony seat about 1,000 people. This auditorium is flanked on the south and west by a very impressively treated foyer carried out in the same architectural style as the auditorium, with numerous wall spaces and alcoves provided for memorial treatments.

The building contains on the ground floor a lecture hall with necessary foyers having seating capacity of about 250. This assembly room and the larger auditorium will be open to gatherings of medical and other scientific societies. There is an additional room which is available for the beginning of the Clinical Research Department and Medical Museum of the American College of Surgeons.

The top floor of the building contains accommodations for literary research work with adequate library stack space and reading rooms.

SUMMARY

A brief review of the Murphy Memorial from its inception to its completion is given herewith.

The death of John B. Murphy on August 11, 1916, created among laymen and the medical profession a spontaneous demand that a suitable memorial be erected to commemorate his distinguished services to humanity and to the science and art of surgery. This demand was so imperative that a number of Dr. Murphy's friends considered it desirable to incorporate an association that could legally investigate the many plans suggested and crystallize these efforts in a way to obtain dignified and permanent results. Among the many plans for a memorial that fulfilled the ideals of the incorporators of the Association, one was paramount, namely, that the memorial take the form of the John B. Murphy Memorial of the American College of Surgeons, as Dr. Murphy was a founder and the first chief of the editorial staff of *SURGERY, GYNECOLOGY AND OBSTETRICS*, now the official journal of the College, an organ

izer of the Clinical Congress of Surgeons of North America, and a founder and member of the Board of Regents of the American College of Surgeons, and in the activities of each of these organizations he was actively and earnestly interested. It was realized that such an affiliation assured permanency and that the memorial would become a living power for the advancement of surgery along scientific and moral lines and in form and use present an appeal to the people of Chicago and the continent that would satisfy them that their monument would perform a service that would be of benefit for all time to all people.

The entrance of our country into the great War scattered the incorporators and caused a temporary cessation of the activities of the Association. In the early months of 1920 the plan of providing a memorial was revived and the Association was reorganized as follows:

Officers: Leroy A. Goddard, president; Charles H. Wacker, treasurer; W. A. Evans, secretary.

Board of Directors: Walter E. Carr, W. A. Evans, Leroy A. Goddard, Edward N. Hurley, James E. Keefe, and Franklin H. Martin.

Building Committee: Albert J. Ochsenrider, chairman; Franklin H. Martin, Edward N. Hurley, W. A. Evans, and Walter E. Carr.

Executive Board: Edward Hines, chairman; Norman Bridge, Walter E. Carr, Edward F. Carr, Edward I. Cudahy, Charles G. Dawes, W. A. Evans, Samuel M. Felton, John M. Glenn, Leroy A. Goddard, John F. Golden, Edward N. Hurley, Samuel Insull, James E. Keefe, Franklin H. Martin, William J. Mayo, John J. Mitchell, Fred W. Upham, William Wrigley, Jr.

The money for the erection of the Memorial contributed by physicians and surgeons and friends of Dr. Murphy were assembled by the John B. Murphy Memorial Association. The construction of the building was begun and the corner stone laid with appropriate ceremony, on October 23, 1923. The dedication and inauguration, which marked the completion of the building, occurred on June 10 and 11, 1926.

Those who lived with Dr. Murphy—his contemporaries, his friends—appreciated him and sought to demonstrate their love by erecting to his memory a monument which, in the words of Dr. W. J. Mayo uttered at the laying of the corner stone, is a fitting monument to the greatest surgeon of his day, John B. Murphy, one of the founders of the College who gave unsparringly of his strength and talents to aid in the establishment of the organization and whose noble spirit will always sanctify this ground.

PRESENTATION OF THE JOHN B MURPHY MEMORIAL BUILDING TO THE AMERICAN COLLEGE OF SURGEONS, JUNE 10, 1926

By LEROY A GODDARD CHICAGO

President John B. Murphy Memorial Association

WE have invited you here tonight to show you what has been done as a grateful tribute to the memory of Doctor Murphy.

I do not believe that there is any virtue in the human heart greater or brighter than gratitude. Much that we enjoy in our lives, not only of material things, but an endless measure of discoveries, developments, and unfoldments more durable than material things, have been prepared for us by those who have gone before. The debt of gratitude carries the same living obligation to those who have contributed to the sum of human achievements and have passed behind the veil as it does to those who are living and walking among us and the debt is just as great. It comes more natural oftentimes to show our appreciation to the living, for in so doing there may be selfish hope of further gain, but tributes to those who have passed on, and almost a decade ago, are without hope of future favors, consequently they are true and unselfish.

This memorial was well earned by Doctor Murphy and is the result of insistent demands from so many sources by those who knew his worth. Many of us who claimed his friendship socially did not fully realize before his passing what a force and of what great value he was to the medical profession, not only in the United States but in other countries of the world. He was not gifted in featuring himself in his conversation, in fact he was very modest. On the other hand his contributions to the surgical literature constitute almost a library in themselves. Tributes that have come from all sections of the world show that he was known by his works. Sir Berkeley Moynihan, the outstanding surgeon of England, expressed in a most polished classic memorial oration delivered in Montreal, his thoughts regarding Doctor Murphy, and I am using his exact words "Murphy was beyond question the greatest clinical teacher of his day. No one who listened to him can ever forget the experience. No one could bear to miss a word and while Murphy spoke no man left his seat."

We are justly proud of this structure, it should invoke the civic pride of every citizen of Chicago, and we want you to look it over before you leave. It may be information to you to know that there is not today in existence in any country a like

monumental fabric that measures up to this one, especially in artistic beauty. This is a strong statement and I am going to make another almost as strong. The presentation of this building to the American College of Surgeons and its acceptance and dedication by that organization marks an important epoch in the history of Chicago. None of us can realize or form any kind of estimation of the far reaching and substantial value that this memorial will continue to be year after year in the future of our city. It establishes Chicago as the permanent headquarters of the American College of Surgeons, the leading association of surgeons in the Western Hemisphere and perhaps in the world. It will be the central meeting place of the surgical profession of the Western Hemisphere. Yes, and more, it will be open to all ethical medical and other scientific societies. Bear in mind, too, that the conditions of acceptance of this trust give assurance that it will be perpetuated for the purpose for which the building has been erected.

The American College of Surgeons is not exclusively a college proper, it is an organization devoted to the advancement of the art and science of modern surgery, as will be better told at the exercises of dedication here tomorrow evening. Doctor Murphy was a former president and one of the founders of the College, and was always intensely interested in its activities.

I know it is risky to mention names in connection with an undertaking of this nature, but I will venture to give expression of appreciation to Mr. Charles H. Wacker, whose name stands for so much in this community. As treasurer of the organization his name was all the assurance that the public needed that the funds would be properly handled. The association, too, was most fortunate in securing the services of Mr. W. E. Carr. While his title was that of secretary, he worked incessantly and effectively in every way to make this undertaking a success. Certainly too much praise cannot be given the members of the building committee. I mention especially Doctors Franklin H. Martin, William A. Evans, and the late Doctor Albert J. Ochsner, all busy men having their own affairs which demanded their attention, but they did not hesitate to give their time and help throughout every stage of the work.

While they necessarily had innumerable demands upon their time yet, they patiently and successfully met the numerous problems that are always incident to such an undertaking.

It is a pleasure for me to express sincere gratitude to Marshall and Fox the architects not only for their extra care in every detail but also for generous contributions and to Zander Reum & Company, the plaster contractors for their extremely satisfactory work. Much credit is due for timely and valuable help to such men as E. L. Doheny, C. H. Matthiessen, Edward N. Hurley, Edward Hines and of blessed memory, the late Dr. Norman Bridge.

And now I feel wholly incapable of giving fitting expression to what should be said next. I wish that words would come to me that would give voice in the delicate loving terms that are demanded for what has been done by Mrs. Murphy and by the three daughters. It was Mrs. Murphy who made this memorial possible by making provision for a donation toward it of \$100,000 contingent upon the raising of \$400,000 more. It was planned that the raising of this \$400,000 be divided into two parts, one half to be assumed by the members of the medical profession and an appeal to be made to the public for the other half. Running true to form and to the spirit of the times it was discovered as the building progressed that a great deal more would be required to complete it as it should be than was originally planned. Doctor Murphy entered into rest in August, 1916 and Mrs. Murphy joined him in July, 1921. Considering this lapse of time and also that so many drives were and are being made for charity for hospitals for educational purposes and other causes of merit

conducted by large organizations and by influential groups, it did seem we had reached the point when there was no further room for us in the Inn. This condition, however, was known only to the insiders, so to speak, and to the contractors. It was finally decided that the discouraging situation of the large deficit that appeared inevitable should be made known to the three daughters of Doctor and Mrs. Murphy. It was hoped that they might supply as much perhaps as one half of the amount required and thereby inspire renewed energy to raise the balance. The daughters took the matter under advisement, but not for very long and replied that they would not pay one half of the balance that they were not unmindful of the value of this tribute to their father and of its importance to this community in which their father had succeeded and where his friends were legion. They modestly and cheerfully stated that they would pay it all.

And now, the undertaking of the John B. Murphy Memorial Association is finished. As a corporation it will cease to exist leaving a successful history with every page a clean record. Here is the building and it is paid for. May it stand for ages as a valuable asset to the American College of Surgeons and the city of Chicago and a testimonial of the love that we all carry for the memory of Dr. Murphy which we will continue to cherish until the last note of time is sounded in our own lives.

On behalf of the Association it is a real delight to place this building into the custody of the American College of Surgeons with the request that its president, Dr. Rudolph Matas who is here from New Orleans formally accept the trust

THE ACCEPTANCE

BY RUDOLPH MATAS M.D., F.A.C.S. NEW ORLEANS, LOUISIANA

President, American College of Surgeons

THIS is a glorious day in the History of the American College of Surgeons, glorious in the realization of a cherished dream and more glorious in anticipation of the future service to humanity that this temple, dedicated to the cult of Surgery, offers to the faithful devotees of her Science and of her Art. It is a day of supreme joy to the thousands who lived close to the radiant soul of John B. Murphy and who loved him for what he taught and what he did for them and for the welfare of his fellows. They are happy to know that his precepts, his teachings and example are to be perpetuated in this incomparable monument to his greatness. It is a proud day for this great city of Chicago, the home and theater of the master's greatest triumphs, when, in honoring him as one of the foremost and most brilliant of her sons, she has exalted her conception of the beautiful by adding this matchless gem of architectural beauty to the crown of her choicest civic possessions.

Love, gratitude, and reverence for the dead have expended incalculable sums of money to perpetuate the memory of those most loved and most distinguished, on costly tombs, mausoleums, and monuments. Many of these have crumbled into dust, many have lost with time their significance and many have ministered chiefly to family vanity. Whether the money expended on such personal memorials has yielded an adequate or best return is questionable.

With greater enlightenment and the development of education which is the nursery of civilization, of learning, and of wealth, an increasing number of men and women have become convinced that the memory of the dead can be best preserved by a memorial building devoted to the welfare, not only of contemporaries, but also of endless generations of posterity.

Hence, numerous memorial buildings, alive with hope, faith, and charity have risen throughout our country, consecrated either to the relief of suffering or to the cultivation of knowledge where by suffering is best alleviated and man's kind welfare is best promoted.

This great city, the capital of northwestern civilization in the United States and a luminous center of medical thought has been blessed with innumerable memorial buildings of this character

Many thousands of people have been and many more thousands of its people will be thereby rescued from sickness, destitution, and ignorance, and these many thousands will cherish in grateful memory the dead, whose good deeds still live, whose lifeless hands continue daily to distribute to the needy inestimable benefits, such as no chilling, barren, creation of uninhabited masonry can ever emulate. As numerous and valuable as have long been the donations to education, it is only in the last half century that a growing, but yet relatively small, number of philanthropists have manifested adequate appreciation of the incalculable benefits to humanity of medical knowledge and the need of fostering and developing the spirit of investigation and research in every department of knowledge that can lend greater power and certainty to medicine in its eternal warfare against disease and death.

In this way, universities, institutes, hospitals, laboratories, schools, and professorial chairs have been and are being endowed by individual or public philanthropy which are expanding the horizon of medicine through the civilized world but in none with more initiative, munificence and vast breadth of purpose than is displayed by the enlightened and generous givers of this God-favored land of ours.

In expression of the same thoughts and purposes, we are assembled here today to dedicate a noble edifice to the service of Surgery and in doing this to commemorate the life and labors of one of her most honored apostles. This memorial, unique in its kind and unsurpassed in its beneficent intent, owes its existence to the communion of many souls which, united by a bond of common sympathy, have touched the magic spring that has given their affections this material form.

The hearts filled with love for the adored husband and father, and for the trusted friend, the hearts of the sufferers filled with gratitude for the life saved and the happiness restored by the master's hand, the hearts of the surgeons of America still thrilled and throbbing in remembrance of the vibrant voice of their dead, but ever inspiring leader, the hearts of a great people overflowing with pride and emotion in the achievements of their world renowned fellow citizen—all these diverse elements have come together and brought their contributions as votive offerings on the

altar of their affections and, in this way, the miracle of beauty that we now contemplate has come to pass

The name of John Benjamin Murphy is now linked for all time with the American College of Surgeons not only by the name inscribed in the façade of this Memorial but by the indelible imprint that his creative mind and stirring personality have left in the history of this organization as one of its prime movers and founders

I am not here to pronounce a eulogy on Dr. Murphy or to review his achievements as a surgeon, investigator a teacher or as a man. This task has been assigned to others who have far greater claims to this privilege but it is appropriate, I believe, that I should give some account of his relations to the American College of Surgeons and to the profound influence that he exercised upon its course and policies throughout its existence and as long as he lived

The American College of Surgeons as the exponent of the most authorized opinions of the surgical profession of this country was called into existence nearly fourteen years ago to meet a demand for improvement and reform in the conditions under which surgery was being practiced and which had led to evils that were threatening the good name and the progress of Surgery. Incompetence defective education and inadequate technical preparation for the responsibilities of the surgeon together with a widespread tendency to exploit the resources of the Art for sordid and unscrupulous motives had bred a spirit of graft which was steadily undermining the high ideals of Hippocratic purity honesty and square dealing which have guided the conduct of medical men throughout the ages. The purpose and mission of the College were therefore to elevate the status of surgery to establish new standards of competence and character for the practitioner of surgery and to educate the public and the profession to understand that the practice of surgery calls for special training and educational qualifications that distinguish the practice and culture of surgery from a mere craft and elevate it to a highly differentiated specialty of medicine. The College in endeavoring to protect the public from the abuses of the unqualified has had to establish definite standards of proficiency and of conduct. In order that the public may discriminate between the fit and the unfit it has created a title which distinguishes the qualified professional surgeon from the amateur and the fake. This is what the title, *Fellow of the American College of Surgeons* means to the medical profession and is intended to convey to the

public mind. In its efforts to elevate the standards of the surgeon, the College has had to concentrate upon his environment—the hospital—as well as upon himself and that is why the great movement for standardization and reform which embraces so large a part of the activities of this College was primarily undertaken. It was evident that the purification of the surgical body so intimately linked with its environment for the proper exercise of its function could never be accomplished without the thorough cleansing of both

In the discharge of its ethical and educational mission, which was its primary function, the College has not lost sight of other great problems within its province to study and develop, and, if possible to solve

In the origin of the College and in the promotion of its ideals of service, Dr. Murphy was one of its most ardent promoters and constant advocates. In at least four of the great enterprises in which the College has been engaged since its inception, Dr. Murphy was largely instrumental in bringing them to a successful accomplishment. Himself an unsurpassed master of the clinical objective or demonstrative method of teaching he made possible—through his own enthusiasm and the influence of his great name—the launching of that colossal enterprise known as the Clinical Congress of Surgeons of North America which had its beginning in Chicago in 1910 and has become one of the most important factors in developing the educational features of this College. In his presidential address at the Clinical Congress held in Boston in October 1915 only nine months before his untimely death he had occasion to verify his prediction that the Clinical Congress would become one of the most useful and practical agencies for the development of surgery in this country. The privileges which the best organized and most effective surgical clinics of the great cities afforded the individual by seeing the work of others and comparing it with his own immediately gave the movement an impetus that has carried it everywhere in the Western continent. The scope of the clinical movement was made not only national but international including all the countries of North America and by the invitation of the English surgeons it extended to the British Isles as shown by the attendance of over 1000 American surgeons at the London Congress of 1914 who were led across the seas by Dr. Murphy as their president. The idea that he upheld was, that the teaching of surgery and medicine by living demonstration at clinical meetings should be international and world wide if the best results for the improvement of all are to be obtained

Through its multiple and varied clinics which bring the most accomplished masters in direct contact with the individual practitioner, the Congress creates an international fellowship and an interscientific relationship that could scarcely be obtained in any other way. It brings the surgeons of the United States, Canada, and other countries of North America into the closest relations. It emphasizes the doing of things rather than the telling. It distinguishes the practical man from the purely theoretic or academic."

In his eloquent pleading for higher standards of surgery he gave all the weight of his authority to the need of proper preparation for its practice, and stressed the point that anyone who would profess to be a surgeon should at least give proof of that study and highly specialized training required to assume its responsibilities, by fulfilling at least a minimum standard of requirements, such as those now exacted by this College of all who seek its fellowship.

In addition, he preached character, honesty, and moral worth as indispensable qualifications for the practice of conscientious and good surgery. In this he subscribed to the magnificent ideas that our first president, Dr. Finney, sought to inculcate with all the strength, purity, and courage that are his by right of example, as the bottom rock upon which the principles that guide this College should rest.

Dr. Murphy was among the first to stress the importance of extending the propaganda for reform in surgery to the hospitals, sanitaria, and other institutions which are inseparably interlocked with the surgeon's work—the surroundings that tell of the surgeon's ability and conduct. To this great movement, which has contributed so materially to the reputation of the College as an agency for service in the interest of the public welfare, he gave, in its formative period, the great benefit of his advocacy and support.

Again, Dr. Murphy's conception of service in elevating the standards of American surgery is well shown in the whole hearted support that he gave to the journal, *SURGERY, GYNECOLOGY AND OBSTETRICS* and *THE INTERNATIONAL ABSTRACT OF SURGERY*. As the editor, Dr. Martin, has written, "Dr. Murphy was the underlying support of this publication, from the time of its inception to the day of his death. He was the inspiration for every move of merit that the journal has stood for and fathered. Dr. Murphy was one of the few who maintained at the first conception of the journal that it would succeed if it were comprehensive and served the needs of the surgeon, and, to this ideal he inseparably attached his

program of personal energy and financial aid." Through the generous action of Dr. Martin, the editor and proprietor, *SURGERY, GYNECOLOGY AND OBSTETRICS* has become the official organ of the College. No one now questions the enormous benefits that this publication has brought to the literary culture, to the technical achievements and the prestige of American surgery in the twenty years of its existence. In its value as the literary arm of the College and as the recorder of the activities of American surgeons this journal today fulfills and surpasses all the predictions of Dr. Murphy, before the publication had come into existence and before he had become the chief of its editorial staff.

Much more could be told of Dr. Murphy's participation in fostering and developing the program of the College and in giving shape to its ideals, but this is scarcely needed to show his profound concern in the welfare of this institution—a concern which continued unabated to the end of his extraordinarily useful life.

One feature of his character which is indirectly related to the history and progress of the College is his loyalty and devotion to his life long friend Dr. Martin, our Director General, whose fertile brain first conceived and gave tangible form to all three of the great triad of enterprises—the Journal, the Clinical Congress, and the College of Surgeons, which will remain for all time testimonials to his genius for organization and as perennial monuments to his vision and statesmanship.

In his presidential address at the Clinical Congress in Boston in 1915, in referring to the difficulties first encountered in organizing the Congress, Dr. Murphy said "There was one man who had vision who outlined the organization, who took up the task of its foundation. By the positiveness of his convictions, by his indefatigable zeal, by his indifference to rebuff and contumely, by a courage founded on the knowledge that he was working unselfishly for a great and good cause, by his fidelity to the medical profession and his confidence that the majority of its members would finally appreciate the true worth of the purposes of the organization, he succeeded in founding the Clinical Congress of Surgeons. He first inspired a few, and then gathered a larger number of representative men and convinced them that the opportunity was at hand and the material available. I refer to its founder and present secretary, Dr. Franklin H. Martin."

Well nigh eleven years have gone by since Dr. Murphy's stirring voice was heard vibrating

in our meeting places, but the echoes linger and still continue to evoke the admiration of all those who knew him and who have been under the spell of his magnetic personality. Those of us who following in the wake of his ideas and his precepts, and who are here to carry on the program that he helped to formulate for the future of this College may well ask ourselves what we have accomplished in these years what the College has done to justify his expectations to confirm his faith in the future of this organization and in its ever increasing capacity for usefulness.

Fortunately the answer has been given in no uncertain or doubtful terms, not once but every year that has passed since Dr. Murphy's untimely death. A glance at the thirteen stout volumes steadily growing larger year by year, and at the files of the quarterly bulletin which are prepared under the editorship of our Director General will show the progress of this organization in its march toward the attainment of its objectives. A glance at these we believe, will suffice to satisfy the most inquisitive and inquisitorial that the College has not been idle or lagged behind in the pursuit of the task set before it by its Founders.

The increasing Fellowship now approaching 8,000 the great and growing popularity of the Clinical Congress the great value of our scientific sessions in bringing the latest products of the laboratory and of scientific research to the eye and ear of the surgical practitioner the education of the people by the wide dissemination of knowledge pertaining to the conservation of health and to the prevention and cure of disease these and more are the direct benefits that accrue to the profession and the public through the annual Congress and the many regional meetings that are held in every section of the country.

In the short life of this association it has succeeded, by combined efforts in profoundly influencing two outstanding reforms in medicine which are unique and peculiar to our profession to our period and to our country. One of these is professional and the other ethical first hospital standardization with the enormous benefits that have followed the survey of the hospitals of this country and Canada by the experts of the College 1,564 hospitals have been standardized in accordance with the minimum requirements prescribed by the College for official recognition and approval. This movement is now definitely and justly credited to the American College of Surgeons. Second the organized fight against fee splitting and other debasing practices is inseparably associated in the minds of the profession and of the public with the successful crusade against

this and other immoralities that has been carried on by the College.

While the College has put the impress of its principles upon the profession and the hospitals of the continent, and the benefits to the public are growing every day more appreciable the College has still a long road to travel before it can reach the goal of its ambition. Both of these movements are speeding along and steadily gaining momentum, and the day is fast approaching when the standards of the surgeon and the hospital based upon a scale of minimum requirements will have to be advanced to still higher and more searching tests in order that the College may attain the best results.

And now as to our ideals how manifold and multiform they are! Even as they are now unfolded before us they are not mere fancies will o' the wisp or the stuff that dreams are made of but practical, tangible and reasonable expectations. In our endeavor to standardize the surgeon and the hospital we are marching onward with a clear and definite objective. The public now knows that it is our purpose that only men who have given proof of their competence by fulfilling the requirements of the College should be entitled to public recognition and trust as surgeons. We also want the public to know that it is our purpose that only hospitals which have submitted to the test of standardization are entitled to their confidence. We know that this is a big bill to fill but we are not sparing ourselves in the effort to meet it. We may never completely eradicate all the evils that beset us, but we can at least minimize them so that the unworthy shall stand isolated and exposed naked in all their ugliness, before the public eye. But, after all, is not our life one long campaign in behalf of other people against ignorance and dirt falsehood and disease? The task of the reformer is hard, the fruitfulness of human nature and the fallibility of human judgment proverbial. But if all the moral and intellectual forces which are represented by this College are united in the accomplishment of the task that we have set before us, are our ideal unattainable?

But these are only a few of the many ideals that we are striving for. There is our bureau of Inter-American relations which is to continue to expand our fellowship in the Latin American republics and to spread the evangel of the universal brotherhood of man in the service of humanity. And again there is our department of literary research our library, our museum the Ochsner Laboratory of clinical research, the offices of the committees in charge of the investigation of cancer and of that

malignant disease of bone—sarcoma—and where all the great surgical problems of today and tomorrow will be threshed. All this work, all these enterprises, have been well begun and have yielded most fruitful results. But beyond these there are still other activities and utilities awaiting our further study and action, as we advance and our endowment increases. With the everlasting change that is ceaselessly going on in the world of medical science, new ideals will arise to replace the vanished concepts of the past and of the present.

And finally, as we contemplate the architectural beauty of this Memorial and consider its destiny, we may see that it is plainly written that it will become the center of the organized activities of the surgical profession resident in the Western Hemisphere. We now recognize, with glad acclaim, that this living monument, built in recognition of the scientific service rendered to humanity by one of the greatest exponents of our Science and our Art, marks an epoch in the relations of the medical profession and the public. It testifies in mute but unmistakable terms that the soul of surgery has found its place in the heart of humanity.

Is it not fitting that here, on the shore of one of the great lakes, in a city which vibrates with the dynamic energy of its millions of people, in a city still so young that the enterprising spirit of the pioneers who founded it has not been crushed by centuries of antiquity—should hold a memorial institution such as this that is looking to the future for the crowning glory of its service? "May

it not be that these waters that restlessly lap on the not far distant lake shore, express the spirit needed by an institution of this young and aspiring type? Now tossed by tempests brewed from dark and lowering clouds, again the incessant beat on the shore of waves generated by the winds of the passing storm, now dark and angry as in a winter's day, with icy blasts and clouds of driven snow, once more quiet and serene in the calm of a summer's day—such are the moods of the lake, ever changing, always varying, and yet constant, enduring, magnificent—a mighty force continually at work from the changing activities of the lake with its reserve of enduring force." May there come from these sources an inspiration and stimulation to this Memorial and to the workers who give it life—no, as the years go by, will lead it into the highways of progress, to the ultimate attainment of its ideals in every field of surgical usefulness and endeavor. To this end may this Memorial endure a lasting tribute to the starlit name it bears—John B. Murphy.

"A lofty name, a beacon light
On the cliffs of Fame."

And now, Mr. Chairman, by virtue of the authority vested in me by the American College of Surgeons, I have the honor to accept the John B. Murphy Memorial building as complete and ready for occupancy and pronounce it now open for the uses of the American College of Surgeons.

J. H. A. Christian. Science 1915 July No 1616 p 551

THE JOHN B MURPHY MEMORIAL BUILDING, THE ATHENEUM OF SURGERY¹

BY WILLIAM J MAYO MD FACS ROCHESTER MINNESOTA

WE meet today to dedicate the John B Murphy Memorial building a home of science and creative art in surgery.

Ten years ago deeply grieved at the loss of a dear friend, I penned a tribute to Dr John B Murphy, and the analysis of his career that I then made has been amply justified by the mature thought of the following decade. It has been well said that by examining the life work and deeds of a man one can get an intelligent picture of his soul. Dr Murphy had that divine discontent which leads to progress, and fires those geniuses who by their researches and altruism, have given mankind their greatest blessings.

The reputation of a surgeon in the final analysis must rest upon originality, teaching by word of mouth, teaching by the printed page, surgical judgment and operative skill. Dr Murphy had a marvelously fertile and original mind. Possessing a brilliant surgical imagination he early deviated from the beaten paths and invaded new territory, and yet with such acumen that nothing which he originated has failed to live. Like those of the great musicians, his productions are still masterpieces; they mark epochs in surgical progress. He made the experimental laboratory a handmaiden to surgery, and carefully investigated every detail of his constructive work by animal experimentation before applying it to man.

As a clinical teacher of surgery he had in my opinion no equal. Clear and logical, he tarted with facts about which there could be no dispute progressed from these facts toward new ground yet along pathways more or less familiar to all and finally taking us by the hand so to speak, he led the way to new truths by the light of his surgical genius.

As one views this classic building devoted to the purposes of the American College of Surgeons, one must recognize that it is a worthy memorial to one of the greatest figures in American medicine. It is especially fitting that this edifice should be devoted to the elevation of the educational and moral standards of the profession which Dr Murphy loved so well.

To the vision and altruism of Franklin H Martin, the American College of Surgeons owes its existence. Dr Martin early saw the funda-

mental weakness of the changing character of surgery as it had developed in America. Surgically speaking we were becoming a nation of operators attempting by facile technique to gloss over serious errors in surgical understanding. The advice of David Crockett "Be sure you are right, then go ahead," was sometimes honored in the breach rather than in the observance. The science and art of surgery in America had outgrown its methods of organization. Day by day the increase in available surgical knowledge was so rapid that it was no longer possible for one mind to obtain a good working knowledge of the various branches of surgery. The term 'general surgeon,' no longer applied, and surgery for the general practitioner could no longer be justified.

In this rapid advance under changing conditions undesirable practices grew up among surgeons for which the commercial and industrial age in which we live was largely responsible. The conception of an organization of surgeons of which the primary purpose would be service to the people made a strong appeal to the keener minds of the surgical profession, of which Murphy was the leading spirit. The undertaking however, met with severe criticism which had its origin to a large extent in the conservatism natural to the profession. It cannot be denied that many honest men who, in conjunction with general practice had been occasionally practicing operative surgery for which they were no longer properly prepared thought they were being surgically disenfranchised. They strongly resented an organization which might even by suggestion impugn their motives or question their ability. The unprejudiced will recognize that it was necessary to change an obsolete custom which while quite proper in the light of the small knowledge of an earlier day, when illumined by the great advances in surgery was clearly seen to be unfair to the patient. It required supreme courage for Dr Martin to abandon an honored position in the surgical world and devote his fine talents to the new venture, and it is to the lasting credit of the surgical profession of America that its leading members almost to the man rallied to his support.

Fundamentally the model of the American College of Surgeons was the Royal Colleges of

¹ Added as given at the dedication of the John B Murphy Memorial Building to the American College of Surgeons Chicago June 1916

England, Ireland, and Edinburgh. The conception of the American College is a tribute to the splendid work of the British institutions which insist, and properly, that learning is the keystone of the arch. The resemblance in details of organization, however, is not marked, because of the different conditions under which surgery is practiced in Great Britain and America. The British Isles are small, with large centers of population containing universities with great medical schools, to which patients can be transported quickly for surgical care, and the general practitioner, in conformity with British custom, perhaps the strongest factor in the Anglo Saxon temperament, has never done and does not desire to do surgical work for which he has no training.

In America the distances between cities and seats of learning are great, and, since the object in organizing the surgeons was to insure that every patient with surgical disease had the most skillful care possible, an organization along different lines from those followed in Great Britain was necessary. A limited organization which would be more or less aristocratic intellectually would not, therefore, answer the purpose. Such organizations, for that matter, were already in existence, for instance the American Surgical Association, the American Gynecological Society, the American Laryngological Association, the American Ophthalmological Society, and others, organizations which were largely for men who were teachers or who had justly achieved a great reputation in practice in their particular specialties. It was generally recognized that in a country of 120,000,000 inhabitants, Canada and the United States, an organization of less than 10,000 members would leave many communities unrepresented and possibly without adequate provision for surgical care. Liberal provisions therefore were made to include in the fellowship many older men who had done good surgical work and only too soon would be replaced, as the inexorable time clock called them from the field. The requirements for the fellowship of the future, however, were placed on a higher plane. It was determined that the men who were to take the places of those of the older school, younger men who have had greater opportunities in modern institutions for medical learning and in hospitals for clinical training must be held to a higher standard.

Very properly, emphasis has been thrown on wisdom as well as knowledge as a qualification for fellowship in the American College of Surgeons. A great many men are capable of acquiring large amounts of information which they are unable to

use, and, since the first purpose of the American College of Surgeons was the proper care of the sick, it was early decided that the ability to make surgical diagnosis, and, when necessary, to operate with wisdom and with safety to the patient, should be made an essential to fellowship. Therefore, mere possession of academic degrees by its prospective fellows would not insure fulfillment of the purpose of the organization, and it was decreed that no man should be admitted to fellowship until a reasonable period, eight years, should elapse after graduation from medical school, in order to judge whether he was making proper use of his opportunity and was steadily progressing. Eventually the so called Junior Candidate group, a probationary organization, was established to include, during their formative period, young men having the basic qualifications for fellowship.

There are, unfortunately, in every profession, and that of medicine is no exception, certain men who do not live up to proper professional ethics. In the practice of medicine a higher grade of ethics must be demanded than in any other profession, because the people are without knowledge of medicine and easily become the prey of charlatans and self seekers who trade on their ignorance. It occasionally happens that a man, otherwise well qualified, justly comes under suspicion of unethical conduct in his relation with his patients and is therefore denied fellowship.

On speaking to a general audience, one avoids as far as possible the introduction of the question of professional ethics in the medical profession, those rules of conduct which are blamed, and usually unjustly, for the many real or fancied shortcomings in our professional relations. Yet experience has shown that in the long run the medical profession, although often unsympathetic, is just.

Today surgeons cannot intelligently practice surgery in such manner as to give the people the best that medicine offers, which is the least that they should have, unless each man is willing to recognize fully the dignity of his coworkers. The surgeon who works alone, who holds his fellow practitioners in contempt which he does not attempt to conceal from the patient, in the long run fails to do what is best for the patient because he does not have the co operation and support of his colleagues, and therefore cannot secure the best conditions for success.

The wisdom of the provision that every applicant for fellowship in the American College of Surgeons must be judged by those who work with him or know him intimately is therefore apparent, and it is evident that the College in selecting its members rightly puts character first.

One of the most frequent criticisms of members of the medical profession is based on the fact that they are slow to adopt new ideas. This is true, especially with regard to those ideas which originate with men who have not had medical training, and who throw emphasis entirely on a method of treatment which has not been properly tested, either clinically or by animal experimentation. Occasionally such an idea possesses great basic value but when one considers that the purpose of medicine is the saving of human life immediate acceptance of every new theory would not be warranted, and extreme conservatism under the circumstances is amply justified.

In the early day, because of the many attendant dangers which have now to a large extent, been eliminated, only operations of urgent necessity were performed. Today surgery of expediency is perhaps the chief work of the surgeon, the object being to prevent conditions which would later threaten life. This is especially true of malignant diseases in which early operation is usually curative and late operation curative only to a small extent.

The education of the public in the past was left too largely in the hands of the quack charlatans, cultists and self eekers. As related to surgical disease the education of the laity has been rightfully taken over in a dignified manner, by the American College of Surgeons that the benefits of modern medicine may be passed around.

The American College of Surgeons is vitally interested in the conditions under which surgery is practiced and no part of the work of the organization has been of greater importance than the standardization of hospitals, and the development of proper hospital staffs and fine training schools for educating nurses. This pioneer work has greatly stimulated the building of hospitals and especially the community hospital where every sick person without regard to color, creed, social, or financial condition can be cared for properly. Correlated with this growth has been one of the most remarkable developments of modern times the understanding by the laity that the sick mem-

ber of the family can be better cared for in the hospital, without regard to money, than in the home crippled by sickness because the favorable conditions afforded by the hospital cannot be duplicated in the home, no matter how wealthy the occupants.

The American College of Surgeons has been in existence thirteen years and it is becoming increasingly apparent that the altruism not only of its founder, but also of that tower of strength Dr. Murphy, who early in the history of the College supported it in every way, has brought forth an institution of extraordinary value to our country. The formative period has passed. The College has good endowments, a suitable home, and this beautiful building devoted to a great purpose, the advancement of learning, research and medical education always from the broad humanitarian standpoint of service. Its fellowship comprises over seven thousand carefully chosen men, controlled by a democratic organization of a board of governors of one hundred and fifty members, a board of regents, a president, and a director general.

In the future, every young man who desires to enter the practice of surgery will find that energy, perseverance, and character will lead him to the desired goal. The requirements for fellowship are reasonable and within his reach.

The foundations of medical learning were laid in ancient Greece and in Athens it had its home. The atheneum was a noble structure in which learning and the love of beauty in thought and fact were nourished. Beautiful as are the physical remains of this temple, even more inspiring are the undying evidences of a great culture which was never lost, although little regarded and often dishonored for nearly two thousand years. The Renaissance brought these evidences of culture to light to act as a guide for all time, proof that while the flame of the torch of learning may be dimmed it cannot be extinguished while civilization shall last. Let us hope that this modern atheneum may fulfill its function in the years to come, a noble monument in memory of a noble man.

JOHN BENJAMIN MURPHY—CITIZEN AND SURGEON¹

By FRANKLIN H. MARTIN, C.M.G., M.D., F.A.C.S. CHICAGO

Director General American College of Surgeons

WE build monuments to poets, musicians, politicians, and statesmen, and we dot our land and fill our parks with statues of our military heroes whose training and vocation have fitted them for the destruction of men, but how few monuments there are to the eminent members of the one profession whose training and vocation are concentrated in the saving of human lives!

This beautiful temple of service, to be devoted to the ideals of practical surgery, is one of the first in this country to do honor to a surgeon. Why was John Benjamin Murphy the first of the surgeons of America to be selected for this distinction? Why did laymen, medical men, surgeons, and friends contribute to this memorial to our neighbor and our citizen?

Murphy was a genius. A genius is one who creates something that is desirable, by perfectly obvious methods, and that by its simplicity and importance captures the imagination of his conferees and posterity. Murphy not only created and had his creations accepted, but by his impelling personality and eloquence, he inspired laymen and medical scientists alike.

His vision was phenomenal and was made practical by an industry that made his dreams come true. His accomplishments were epoch-making and few chapters in the text-books of the future can be written without reference to the pioneer work of Murphy. We are awed when we realize that Murphy was the first, or among the first, to develop Suture of the blood vessels, surgery of the chest, surgery of the brain and spinal cord, surgery of the appendix, surgery of the intestines, including the invention of the Murphy Button, and, finally, one of the greatest of his achievements, surgery of the bones and joints.

Murphy's accomplishments were of the first importance. He was not only an originator in these branches of surgery, but as well an authority universally recognized, and his name will be associated with these subjects so long as there is a surgical literature.

But Murphy was more than an inventive and a mechanical genius. He possessed the ability to impart his knowledge. He was our greatest interpreter of surgery. He was eloquent in speech. His was true eloquence, not mere oratory, and he carried his hearers by force of

personality, thorough knowledge of his subject, an enthusiasm that was irresistible, and a directness of attack that left no room for misunderstanding.

Dr. Edward Martin, of Philadelphia, once said "I go to Murphy's Clinic determined to remain unperturbed, but in five minutes I find myself on the edge of my seat, enthusiastically waving my hat." This confession by Edward Martin, no mean critic of dramatic art and a peer among teachers, will strike a responsive chord in every surgeon before me who attended the Clinics of Murphy.

As an interpreter, Murphy was a prolific writer. His many volumes of *Clinics*, published monthly, contained the very quintessence of his operating work, the very lifeblood of this master surgeon.

As an individual, he was first of all a family man, devoted to his wife and children, of whom he was justly proud and who in turn worshipped him. He possessed a strong religious conviction, and his church and his religious duties were always scrupulously attended to.

He was a great and loyal friend. In his later life, I was honored by his friendship. In my long acquaintance with him, I never heard him speak critically of any one. Like all great men and prophets, he was frequently "without honor in his own country."

On occasion, when injustices by word or deed were being done to him, I insisted that I and his friends would not tolerate these actions, that we would expose the detractor. He would raise his hand in protestation and, smiling say "Oh, no, leave them alone, they know not what they do."

When Murphy died in 1916, at the early age of fifty-eight, he was mourned not only by those of us who were his neighbors, but by the whole world. Countless tributes were paid to him as a great surgeon and teacher by his Chicago conferees, and preserved by his family. May I quote a few of these? Dr. Albert J. Ochsner said "Murphy was the one man whom the whole surgical world knew as a great American surgeon." Dr. William A. Evans "He was the greatest surgeon of his day in the world." Dr. William E. Quine "It is an open question whether the passing of a private citizen ever occasioned a more powerful or widespread shock than did the

¹Presented at the inauguration of the John B. Murphy Memorial Building June 11, 1926.

passing of our friend. Even distracted Europe felt the jar. A citizen of the world has passed away. 'Dr Frank Billings. 'We soon for get, but we remember great landmarks.' Dr Frederic A. Besley. The world has lost the greatest surgical teacher it ever had and no man's mind can estimate the extent of the far reaching influence of his teachings. Dr Arthur Dean Bevan. He was one of the most original thinkers American surgery has produced.

From the medical profession throughout the country came tributes. Dr Harvey Cushing of Boston said 'He stood second to none in the country and to few in the world.' Dr C. A. L. Reed of Cincinnati. Dr W. W. Grant, of Denver. Dr Norman Bridge of Los Angeles. Dr John A. Wyeth of New York. Dr Emory Marvel of Atlantic City. Dr Stewart Lobinger of Los Angeles. Dr Robert Coffey of Portland, Oregon, and Dr William D. Haggard of Nashville all spoke words of praise. Dr J. M. T. Finney, of Baltimore said 'A wonderful personality, an inspiring teacher, a splendid surgeon, a true friend, a real man, his going has left a gap that can never be filled. Dr William B. Coley of New York and Dr Ingersoll Olmsted of Hamilton, Ontario spoke of his greatness. Dr Charles H. Mayo of Rochester, Minnesota said 'He was the greatest surgical teacher of his time. Dr Murphy will live in history as one of the greatest builders of modern medicine. Dr George W. Crile of Cleveland. Dr Murphy taught by monographs as others have taught by words and his teachings have influenced not only the American continent but also Europe and the Far East for Murphy taught the world.' Dr William J. Mayo of Rochester, Minnesota said 'In the death of Dr Murphy America has lost its foremost surgeon. His untimely death in the flower of his great career saddened us all. A man of genius, original, forceful and of magnetic personality, he was honored above all men as a teacher in surgery.'

And among others was the dean of surgery of this continent, Dr William Williams Keen, of Philadelphia, who said 'He leaves a great legacy of an astonishing amount of the best work done by any surgeon in America. He has left his imprint on surgery for all time.'

The surgeons of the old world took time in the midst of war to pay homage to the memory of Murphy, among them Sir Arbuthnot Lane, Bart., and Mr Herbert Paterson of London, England. Sir Rickman J. Godlee, Bart. of London, the nephew of Lord Lister, said 'I fell under the spell of Murphy's most original eloquence, which

made hidden things clear, and shed over well known facts such a glamour that one seemed to be hearing of them for the first time from the lips of their discoverer. America has lost an incomparable teacher as well as one of her greatest surgeons. Professor Raffaele Bastianelli, of Rome, and Professor Theodor Tuffier of Paris, also hesitated from war to pay their tribute. Sir Berkeley Moynihan, Bart., of Leeds, England, in summing up his eulogy to our hero in his John B. Murphy Oration, in 1920 said "Year by year Murphy grew in intellectual power and in the dominion he exercised over the minds of men. A problem took on a different aspect if Murphy were engaged in it. He touched the common currency of surgical thought and changed it into gold. For no effort of his was meaningless or sterile and all the powers of his mind and of his frail body were spent ungrudgingly in all his work. As we look backward upon the long history of the science and art of medicine, we seem to see a great procession of famous and heroic figures, each one standing not only as a witness of his own authentic achievements, but also as a symbol of the traditions, ideals and aims, of the age which he adorns. They are men whose deeds will not be forgotten and whose names will live to all generations. Among such men, few in numbers, supreme in achievement, John Benjamin Murphy is worthy to take his place."

Statesmen, business men and educators knew Murphy's worth and heralded his fame. Among them were Governor Edward F. Dunne of Illinois. President Edmund J. James of the University of Illinois, Harold F. McCormick of Chicago, Sir James Grant of Ottawa, Ontario and President Harry Pratt Judson of the University of Chicago. His eminent patient, Theodore Roosevelt, said "Dr Murphy was one of the most useful men in this country and one of the men who added to our reputation all over the world. He was a great surgeon of international reputation and he was as staunch and whole hearted a patriot as this country had. He was a great American citizen." And Woodrow Wilson said 'The medical world loses one of its foremost figures and our country sustain a real loss. I am sure I express the feeling of the whole country when I mourn his going.'

Probably the most unique recognition that any surgeon has received came to Murphy from His Holiness, Pope Benedict XV—the Christian Knighthood and the apostolic blessing an honor which was conferred upon him in recognition of his services to humanity and of his many works of Christian charity.

Murphy was conspicuously honored by his confreres through the duties and distinctions they placed upon him. He was professor of surgery and chief of the surgical department of Rush Medical School, the medical department of the Chicago University, and subsequently he was made Professor of Clinical Surgery of Northwestern University Medical School. He was the president of the Clinical Congress of Surgeons of North America, and president of the American Medical Association.

So it is no mystery that this beautiful temple of service, the first of its kind to be built in this country by voluntary contributions of laymen and medical and surgical confreres, was created to honor Murphy, a member of the surgical profession. This building will be to America what the John Hunter memorial of the Royal College of Surgeons of England is to Great Britain and the whole surgical world.

Of this noble soul we may truly say,

"He went away as he had lived, nobly careless of himself and thinking only of the things he had undertaken to do."

And may I further say of him that by thought, by action, and by self discipline, he trained a body and mind, given by a pure inheritance, into a strong physique, an acute brain, and a dominating personality.

With unsatisfied industry he acquired the knowledge of his art and made his mind a possessor of the recorded deeds of his confreres of the world.

He learned surgery, serving with indefatigable energy the needs of helpless humanity, and taking counsel of his fellow workers in every field old and new, in which his profession was practiced.

He had a creative mind, trained to investigate facts, and suspicious of traditions, with a courage to bring forth the new, a judicious mind that judged so correctly the value of the new his genius brought forth that the things he wrought were recognized by science as enduring principles.

With an irresistible enthusiasm, begotten by his appreciation of truth, he imparted the knowledge from his great storehouse in a way that appealed to the mind, the conscience, and

the responsibility of his hearer, and that made him the impelling teacher of his time.

His experiments were made in the laboratory, in the mortuary, and in the dissecting room. He thus proved theories by facts, but never at the expense of those whom he served.

The impelling text of his life—in experiments, in writing, in the practice of his art, and in his burning utterances as a teacher—was "Have uppermost in your mind the welfare of the individual who entrusts his life to your care."

He worked and pleaded for higher standards, he was democratic in his methods, and he condemned complacent, entrenched interests as a bar to progress. His life was a protest against ignorance and pretense. He believed that most things worth while came from those not bound by tradition. He encouraged the beginner and listened to the obscure.

He labored with more and more concentration of effort, as the wonders and possibilities of his task were revealed, trusting his strong body, inured by abstemiousness and continuous work, to perform the almost superhuman task imposed upon it. And then the body broke, and his life, in the fullness of its power, was sacrificed. "Greater love hath no man than this, that a man lay down his life for his friends."

He loved God and expressed this love through his work for men and little children. He was the devoted father, the beloved husband, the staunch friend, and an inspiration to all who came within his influence.

He was a human man who, through many years of self discipline, indefatigable work, untold sacrifice, and desire of the highest service, developed into a superman—the high priest of the most exacting of professions.

And now, friends, before I draw the curtain over this inadequate sketch, may I venture to say that while we are here gathered to pay homage to Murphy, the great man, the great surgeon, and the true friend, we may be assured, if the screen is not too impenetrable, that around us, in approbation, are the spirits of him and of his devoted wife, and over us is shed their love and benediction.

THE AMERICAN COLLEGE OF SURGEONS¹By GEORGE W. CRILE, M.D., F.A.C.S. CLEVELAND, OHIO
Chief of Clinic

THE primary purpose of the American College of Surgeons is thus stated in its year book:

The American College of Surgeons is a society of surgeons of North and South America which aims to include within its Fellowship all who are of worthy character and who possess a practical knowledge of the science and art of surgery. The College is concerned fundamentally with matters of character and of training with the betterment of hospitals and of teaching facilities in medical schools and hospitals with laws which relate to medical practice and privilege and with an unselfish protection of the public from incompetent medical service.

As the above statement indicates, the founders of the American College of Surgeons felt that the public in general has the right to depend upon those who have had special training in any line to be the leaders in that line. Moreover professional service of whatever nature, to be effective must be of service to the public. Such public service must be exercised primarily through the avenue of public institutions. In the case of the medical profession the principal avenue of public service is of course the hospital.

According to the last report of the American Medical Association there are 7,370 hospitals in the United States with a total of 813,920 beds thus constituting a possibility of giving 797,082,990 days of service to patients in the course of a year together with the 367 hospitals in Canada with a total of 31,443 beds 308,560,415 days of service can annually be given to patients in these two countries, and according to published reports over 12,000,000 individual patients pass through these hospitals each year. The land, buildings and equipment of these hospitals represent a grand total investment of approximately \$3,187,000,000.

To one who has the sentiment to read into statistical figures an emotional significance, the first thought suggested by such huge figures would be that the sick public must be very completely provided for, and certainly this large investment of money bespeaks a very large and exceedingly generous public. But the above total of 7,373 hospitals in the United States and Canada includes hospitals of all sizes from those containing less than ten beds to those containing more than 300 beds, and it includes also not only hospitals of the highest degree of efficiency but also hospitals the efficiency of which is far below what the public has a right to demand. In addition, in the United

States alone, according to a recent survey by the American Medical Association among the total of 3,068 counties, 1,367 did not have a single hospital for general local service.

If the public, therefore is to be wisely, efficiently, and abundantly supplied with hospital service, not only must more and larger hospitals be provided but it is primarily essential that a certain standard be established and that by the publication from year to year of the list of hospitals which meet that standard an impetus be given toward increased efficiency of hospital administration and of professional service.

Moreover, in addition to the care of the sick patients who occupy these 845,371 beds these hospitals serve as training schools for young physicians who have graduated from medical schools but must seek their first practical experience within the hospitals under the guidance of surgeons and physicians of experience. Some of these internes remain attached to hospital service but others go out into private practice, thus widening the sphere of ultimate usefulness of the hospitals far beyond even the indications of the huge figure given above. In addition these hospitals also are the training ground for the tens of thousands of nurses required to care for our sick public.

For all these reasons the primary endeavor of the College has been the standardization of hospitals. In this campaign the closest co-operation and support have been given by the American Hospital Association, the Catholic Hospital Association, the Protestant Hospital Association, the Board of Hospitals and Homes of the Methodist Episcopal Church and the Baptist Hospitals. The American Railway Association has requested its 14,000 surgeons to use our approved hospitals wherever available, and to standardize the hospitals under their immediate control. General Hines asked us to survey the Veterans Bureau hospitals so that the institutions for the care of soldiers may meet the requirements laid down for acceptable lay hospitals. The Marine Hospitals and Surgeon General Cumming of the Public Health Service also asked for our survey. The movement has met the approval of the great philanthropic foundations and the Carnegie Corporation has financed the hospital standardization activities of the College to the extent of \$105,000.

¹Presented at inauguration of the John B. Murphy Memorial Building, June 1, 1916.

From the time when this survey was first undertaken until the close of 1925, 10,862 individual surveys of hospitals had been made and 6,412 hospitals had been approved. The effect of these surveys is indicated by the fact that, whereas in 1918 only 12.9 per cent of the hospitals surveyed met the standardization requirements, in 1925, of 995 hospitals of 100 beds, 89.3 per cent met the requirements.

No report of this standardization program could be complete without a special word regarding the splendid sympathy and assistance of the Catholic Hospital Association under the leadership of the Rev. C. B. Moulmier, S. J.

The expense of this program is not slight, and until 1922 it was impossible to extend our work to the many hospitals containing less than 100 beds. Through 1925 slightly over one half million dollars had been expended (\$552,000), and it is to the everlasting credit of the American College of Surgeons that its Fellows have contributed this large sum for better hospital service to the public.

In order that hospitals may meet standardization requirements, the public at large must be cognizant of the need and must help to supply the necessary funds. Physicians and surgeons in each locality also must appreciate the possibilities of the program and must realize to what an extent it may promote their individual efficiency as well as the efficiency of hospital service. Therefore, it is important that the public at large as well as the individual physician should be cognizant of the advances in medical science, of the extension of public health control, of the way in which problems of such widespread individual significance as the cancer problem, for example, are being studied. To this end the College has inaugurated a plan of sectional meetings to give members of the profession throughout the country the opportunity of hearing scientific discussions by surgeons beyond their own territory, to give the public the opportunity of hearing addresses by leaders of the profession and by prominent lay-men, and to bring together hospital administrators in each locality for the discussion of the problems encountered by them in the standardization program.

The attendance upon these sectional meetings has increased steadily during the past year and these meetings have become, we believe, permanent institutions, helping the ideals of the College and the movement for hospital betterment. During 1925, 12 sectional meetings were held, covering 36 states and provinces.

We confidently believe that any report of the extent of interest and activities of the American

College of Surgeons will soon become truly a Pan-American report. Increasing numbers of Latin-American surgeons are being included in the list of Fellows, and two official expeditions by officers of the College to South America have done much toward cementing a relationship which can not fail to be of the utmost value not only to the surgeons of all the American countries but also to the public at large because of the increasing commercial and social relationships among these countries. In fact the international scope of the College should be emphasized by the statement that in addition to the countries in the Western continent, our list of Fellows now includes surgeons from Great Britain, Australia, New Zealand, India, Italy, Egypt, China, Korea, Syria, Turkey, and the Fiji Islands, to say nothing of the honorary fellowships which have been conferred upon distinguished surgeons in foreign countries. This international relationship was emphasized early in our history by the gift of the great mace to the American College of Surgeons by consulting surgeons of the British Army, in memory of mutual work and good fellowship in the Great War.

Any description of the organization and work of the College would be incomplete without a passing word as to the personnel responsible for carrying the load. Dr. Craig and his group have, with untiring zeal, carried the activities of the College to every state and province. Dr. MacEachern and his group not only have surveyed all hospitals of more than 50 beds in Canada and the United States, but he has just returned from a standardization trip made at the request of the Governments of Victoria and New South Wales, Australia, and New Zealand, in which he traveled 31,000 miles, and filled 279 engagements. Standardization service has been carried also to China, France, Porto Rico, and Uruguay.

In a single generation there arose only a few men with a genius and a passion for organization. Such a man, in my opinion, is exemplified in the person of our Director General, Franklin H. Martin. I believe that the past achievements, the present status, and the future outlook of the College could not have been created but for his fine and brilliant service.

Our present status includes a membership of 7,461, endowment funds contributed by the Fellows of the College, invested in gilt edged securities amounting to \$692,000, adding to this amount the value of our land and buildings, we have total net assets of over \$2,000,000. But of far greater importance than this investment is a superb organization of able and tireless workers in every department of our activities.

THE SURGERY OF AMERICA¹

BY W W CHIPMAN BA MD LL D FRCS (EDIN) MONTREAL QUEBEC

President Elect American College of Surgeons

IT is indeed a great honor to speak for the Surgery of America a great honor, and a large undertaking. And the task is not made easier but is rather rendered more critical and more difficult in that I stand tonight with some of the greatest exponents of this handicraft, some of the most skillful surgeons of our time.

We have heard of the illustrious surgeon in honor of whose name we are assembled, and of the American College of Surgeons our own corporate body of surgical associates, now some thirteen years in existence. And I am to speak tonight chiefly of the effort and the work that preceded these the long endeavor that created as it were John B. Murphy, and the College that he loved so well. For, the Surgery of America is in very truth the ancestry both of the Maa himself and the Institution a sterling ancestry of some three centuries.

Where American surgery has done so much the difficulty is great to say so little.

Thucydides said of the ancient Greeks that they possessed the power of thinking before they acted and of acting too and it is just this power of thinking and of acting that has set its seal upon this later Magna Graecia—our own America. This is our large inheritance from the Northern Greek the Anglo-Saxon race. The Pilgrim Fathers and the Virginia Company changed their sky, it is true but they changed neither their character nor their characteristics. They brought with them their own race qualities a courage a practical sense an energy in work and above all, a love of freedom and they stamped these as a seal upon us, a lasting impress for through chance and change we are, and we always will be, an English speaking and an English thinking race.

And the New World has but strengthened and accentuated these racial characteristics. Assuredly, there was a large house to put in order, and abundant need of energy originality and self reliance. And so, from the beginning, through necessity of inheritance and environment these have come to be the essential qualities of our national genius. And the surgery of America partakes of these things, for it hears and has always borne, this self same impress.

It is a record of three centuries for three hundred years ago Giles Firman Samuel Fuller

and John Winthrop practiced medicine in Massachusetts while Lawrence Bohun and John Pott were fellow physicians in Virginia. These men not only practiced medicine, but they took an active share in civil life sometimes, in Massachusetts even as the apostle Luke, they preached the Gospel the 'angelical conjunction' of Cotton Mather. Giles Firman was our first medical teacher as usual underpaid, for, later on he took Orders, finding physics 'but a mean help'.

These men and their successors were our first practicing physicians men of sterling worth and the biographer naively adds, "men of constant if not warm affections." They practiced the surgery of their time, where Ambrose Paré of the famous ligature had already lived and died, and William Harvey had but just discovered the circulation of the blood.

A wonderful band of men—even from the beginning! For it was they and their successors who at due time founded our medical schools and really created American medicine. Of such were John Morgan Benjamin Rush, William Shippen, Junior Samuel Bard Caspar Wistar Phillip Syngue Physick John Warren, and James Lloyd. The very names are enough to recall their greatness. We read of James Lloyd that he was an eminent surgeon in Massachusetts using Paré's ligature instead of the searing cautery, that Benjamin Rush is justly named the American Sydenham, and that Phillip Syngue Physick, who introduced the absorbable ligature is called rightly the Father of American Surgery.

These were great men and they lived in an auspicious time, for the revival of medicine in England in the 18th century was at its height. They had all worked and studied with John Hunter the founder of scientific surgery and the greatest scientist since the time of Aristotle the one he remembered a Greek, and the son of the Stagesira physician twenty centuries before and the other a Scot, the son of the Calderwood laird. They had studied also with the great brother, William Hunter, with Samuel Sharp, Cheselden and Pott. Seven of them were graduates of the University of Edinburgh, where they sat under the Monroes Cullen, and John Bell. These were the men, and it was at this time that there were laid the foundations of American surgery Morgan Shippen Rush,

Peritoneal Cavity for All Intra peritoneal Conditions Following John Stough Bobbs of Indiana, Sims was the second man to perform a cholecystotomy for the removal of gall stones. His statue in bronze stands in Bryant Park, New York, erected by his "professional friends, loving patients, and many admirers throughout the world."

By this time the gates of major surgery were thrown widely open and before the coming of Lister, it is interesting to observe the great results that were achieved. Amputation of the extremities was freely undertaken. John Collins Warren had already excised the hyoid bone and accomplished an excision of the elbow joint. Henry J. Bigelow performed the first excision of the hip joint in America in 1852, and explained the mechanism of the iliofemoral ligament, named after him, the Y shaped ligament of Bigelow. In New York, Valentine Mott was proving himself a worthy successor to Wright Post. Post a famous pupil, in ligation for aneurism, of the great John Hunter. Profiting by this example and applying the precepts of Horatio Gates Jameson embodied in a Prize Essay, entitled *Observations on Traumatic Hæmorrhage Illustrated by Experiments on Living Animals*, Mott proved himself one of the boldest and most skillful operators of the time. He resected the right half of the lower jaw, removed the clavicle for an osteosarcoma, tied many times the primitive carotid the subclavian, the two iliacs and the femoral, and finally performed a first ligation of the innominate. In the South Benjamin W. Dudley's reputation rests mainly upon his operation of lithotomy performed by him it is said 225 times.

But Samuel D. Gross was the greatest of them all. Sometime professor of surgery at Louisville and Philadelphia and laureate of Oxford, Cambridge and Edinburgh, he did more for the advancement of American surgery than any individual of his time. His talents were many and manifold, for not only was he an original investigator and a distinguished surgeon but both as a teacher and a writer he was a notable exponent of his craft. He contributed valuable monographs on diseases of the bladder and on foreign bodies in the air passages, wrote a systematic treatise on pathological anatomy, and finally in 1859 published in two volumes his famous system of surgery. This pathological treatise and the complete system were the first of the kind to appear in America.

A literature is the most authentic record of work accomplished, and it is interesting to trace the growth of this surgical literature. There was

first published the work of John Jones in 1775 his "Plain, Concise, Practical Remarks on the Treatment of Wounds and Fractures," as he calls it, there followed *The Elements of Surgery*, of John Syng Dorsey, in 1813, and, in 1824 "The Institutes and Practice of Surgery," by Professor William Gibson and finally there appeared "The Complete System," by Gross himself. You will observe that this surgical literature marks a steady, step by step gradation during these 84 years. The record of this work appears all the more wonderful today inasmuch as Gross tells us that, in 1876 there is not a medical man on this continent who devotes himself exclusively to the practice of surgery. Truly the Golden Age of the general practitioner!

And now we come to Lister. You will remember that he published his first report in 1867—two years after the close of the Civil War and that like so many prophets, he was at first without honor in his own country. James Chadwick tells us that he saw Lister operate in Edinburgh in 1873 and "swayed by the scoffing of my preceptors I failed to grasp the significance of his principles." Lister's scientific vindication came with the work of Robert Koch in 1876, and it was chiefly through Germany that this wonderful discovery was transmitted to us.

And now the lalæidoscope quickens for by reason of anesthesia and antiseptics, surgery had come at last to its own. The American Surgical Association was founded in 1880, 46 years ago a gathering of the right men in the right place. And these men now passed from strength to strength from one achievement to another in the surgery of bones and joints, and in the three large cavities of the body for the brain itself was not exempt.

One of the most brilliant chapters of American surgery is concerned with the vermiform appendix, the diagnosis and treatment of its disease. The first step in the recognition of appendicitis was taken by George Lewis of New York, in 1856. There followed in 1867 the tentative operations of Willard Parker in simply evacuating the appendix abscess and subsequently the co removal of the appendix itself by R. J. Hall of New York and Thomas G. Morton of Philadelphia. A complete understanding of this lesion we owe to Reginald Fitz of Boston while the indications of surgical treatment were definitely outlined in 1889, by Charles McBurney of New York.

No less brilliant was the history of the surgery of the intestines and the stomach. This began naturally with the repair of bowel wounds, and there followed from this the resection of the bowel

itself, and the various anastomoses. Intestinal wounds had long been a subject of great interest, and as early as 1805 Dr Thomas Smith had presented this subject as his inaugural essay to the University of Pennsylvania. In 1843, we find Samuel D. Gross experimenting upon dogs as to the nature and treatment of these wounds, and applying these results to actual practice. After him there came the work of Charles Parkes and Nicholas Senn of Chicago, and of William T. Bull and Robert Abbe of New York.

Senn was an acknowledged master in intestinal surgery. He was among the early and successful experimenters in gastro-enterostomy and bowel anastomosis, and no small part of this experimental work was done in a laboratory under the sidewalk of his home in Milwaukee, before his final removal to Chicago. The use of decalcified bone plates, and inflation method for detecting bowel perforation, and his heroic service during the Spanish American War made him pre-eminent. A prolific writer, perhaps his most important contribution was his "Pathology and Surgical Treatment of Tumors." He was the life long friend of Christian Fenger, to whose knowledge of pathology he owed so much, his library and his gift of a Clinical Building to Rush Medical College, are in this city his visible Memorial. The work of Senn led naturally to the achievements of John B. Murphy, of whom we are hearing this evening. Albert J. Ochsner was for five years Senn's chief of staff, and began in this clinic his distinguished work.

A contemporary of Senn in the West was Maurice Richardson in the East. Maurice Richardson, assistant professor of anatomy at Harvard, under Oliver Wendell Holmes, and later, Mo elev professor of surgery, and surgeon-in-chief to the Massachusetts General Hospital. To the many new problems of the antiseptic era, Richardson brought his anatomical skill, a tireless energy, a gift of originality and clinical acumen. When he began his work, abdominal surgery, as we have seen, embraced little more than the occasional removal of an ovarian or uterine growth, for a recognized surgery of the appendix, gall bladder, bowel, or stomach did not exist. Richardson was a friend of Fitz, and was quick to corroborate and develop the latter's teaching concerning the diseased appendix, for in his first twenty years of practice he had operated upon some 757 of these cases. His first cholecystotomy for gall stones was reported in 1889, and

in the subsequent years he did much to place on a solid foundation the surgery of the biliary tract. For a time he was greatly interested in brain tumors and in nerve injuries, so widening out the frontiers of modern surgery. After a strenuous life, it was given him to die in his sleep.

William Stewart Halsted became professor of surgery at Baltimore, in 1889. He was known to us all as an accurate, a thorough and painstaking surgeon, and he will be long remembered for his radical operation in cancer of the breast, his circular and bulkhead suture of the intestine, his work on the blood vessels, and the introduction in 1890 of the use of rubber gloves.

And so we come in this short and fragmentary way to the surgery of the present time, and I need not tell you that this wide domain of the healing art is in safe hands. There is so much that I have been compelled to omit, and not the least, all the brilliant work of the several specialties which constitutes so large a part of America's rich endowment.

Tonight the particular has been included with the general even in respect of our minor prophets, "les petits prophètes," as Verneuil calls them, names unmentioned, but worthy of all honor and remembrance. At this time and in this place you will forgive one personal reference. It concerns Thomas J. Watkins, sometime gynecologist of St. Luke's Hospital, and professor of gynecology in Northwestern University Medical School, the late Dr. Watkins, whose special work our society admired so much and the friend we loved so well.

As we have seen, it all is the work of three centuries. During these three hundred years America has contributed generously to surgical resource, for she has given anæsthesia together with rich gifts of her own achievement.

Through all this long inheritance America has steadily pursued her practical individual way, adapting means to ends, and developing the particular measure of her gift. In respect of the future, she must concern herself with special thinking and research, for it is only with a right conjunction of thought with action, of science with art, that she can continue to be a growing point—the great growing point of coming generations. John S. Billings puts it well when he says "it is quite probable that the John Hunter or the Joseph Lister of America is now busy with his preliminary work." We have faith to believe this, that such men are taking thought to add a cubit to our stature.

THREE DECADES IN SURGERY¹

BY GEORGE DAVID STEWART MD FACS NEW YORK

I HAVE been asked to speak of the changes that have taken place in surgery within the range of my experience almost commanded indeed to summarize the changes but, obviously only a few can be even referred to and these in the briefest way. A summary would be so tedious that I think it better to speak of the more striking changes as they appear to me. Dr John B. Murphy whose memory we are here to honor belongs to practically the same period and did much important and enduring work in this era of development, improving technique and enriching the literature of the profession as much, perhaps more than any man of his time.

Modern surgery dates from two men Pasteur and Lister. Prior to their time, infections of wounds were the rule and the only surgery that was dared was the surgery of extreme necessity. Pasteur while studying wines showed that fermentation was due to certain small organisms in the air. Lister saw in fermentation a resemblance to putrefaction and soon proved that infection and putrefaction in wounds were like fermentation caused by certain small organisms that had been heretofore regarded as casual and concomitant. Lister's first efforts then were to control the germs in the air for which he devised the famous carbolic acid spray—now a memory—and an impermeable dressing for wounds called the mackintosh, because it was waterproof. The spray had disappeared before I studied medicine but the mackintosh was still in the textbooks and I recall giving a good deal of time to memorizing its layers just prior to an examination. About that time however the air as a purveyor of germs to wounds was losing its relative importance and it was being realized that the hands, instruments, dressings, and every other thing that came into contact with the wound were more dangerous. For the purpose of cleansing the hands, bichloride of mercury was in common use and solutions of 1:1000, 1:5000, and even stronger were employed. I recall pouring, at the suggestion of my visiting surgeon a strong solution of bichloride into the peritoneal cavity in a case of suppurative peritonitis with a result that was so promptly disastrous that I never did it again. In later years I read a story of Ambrose Paré the John B. Murphy of his time at the Siege of Milan which recalled my experience. Boiling oil was then the usual method of treating wounds and on one occasion after a

battle the supply of oil falling short Paré, much to his regret, was compelled to treat some of his poor wounded soldiers with oil of roses and Venice turpentine. He relates that he could not sleep that night like many another poor surgeon the ages through, so rising early he visited the hospital tents to find that the men without the boiling oil dressing were much more comfortable than those who had been treated *secundum artem*. He never used oil again. Instruments, in my time, were sterilized by soaking them in a solution of carbolic acid and the catgut for sutures was kept continuously in juniper oil, a process which, while destroying ordinary germs, had little effect on anthrax and the more resistant spores.

Our ideas of germs were then very vague and it was not fully realized by everyone, I doubt if it is fully realized even now, that the germs were in the tissues, not sitting on top of their epithelial worlds. Because of this conception great quantities of antiseptic solution were poured over the field of operation into wound cavities, particularly infected cavities, with much the same idea of mechanical cleansing as that held by the maid who flushes with water the kitchen stairs. In consequence in many clinics rubber boots and aprons were a part of the surgeon's equipment and the operator who had neither, particularly if he went to a country home to operate often returned, no matter what his political affiliations belonging distinctly to the *flats*. This was truly the age of antiseptic surgery when the aim was to find a solution to kill the germ but spare the patient, a quest which has continued unsuccessfully ever since.

This was succeeded by the *aseptic* period when the effort was not to destroy the germs so much as to avoid them and it is in this period that we are operating today when soap and water and alcohol and iodine and other non irritating fluids are relied upon to cleanse the field of operation and hands—the latter being protected further by rubber gloves one of the really great discoveries of surgery—when instruments and dressings are boiled or steamed and sutures are prepared by various methods, but always by specialists. So thorough is surgical asepsis now that very few operative infections occur, and in the opinion of many, efforts in this direction have been carried about as far as it is possible to go. Asepsis, however, does not take care of the infections that occur outside

of the surgical amphitheatre following wounds or disease, and for the treatment of these, new antiseptics are being constantly tested and recommended. There is, thus, to some extent a reaction to the days of antiseptics, but no solution has yet been found that is entirely successful and capable of destroying the germs circulating in the blood—in blood poisoning, etc.

The white blood cells derived from the reticulo-endothelial system possess powers of defense and repair so remarkable that our greatest surgeon has said that "the decision to operate in an acute condition may finally rest on a rising white cell count." My colleague, Arthur M. Wright, has demonstrated experimentally that a few drops of blood, that of the patient or the experimental animal, injected into the pleural or peritoneal cavity, will promptly cause a decided rise in these cells, and in a case of osteomyelitis where the cells continually kept going down below the danger point, he was able to increase them by this method, saving his patient. Our knowledge of these remarkable cells also belongs to the era in surgery of which we are speaking.

If modern surgery dates from the discoveries of Pasteur and Lister, the application of their discoveries to the treatment of wounds was made possible by another discovery—that of anesthesia. No matter what assurance might be given the patient as to freedom from infection and inflammation there would be few to accept this guarantee unless there could also be offered the solace of unconsciousness. Local anesthesia, a remarkable addition to the surgeon's resources, is almost entirely a development of this period of surgery. Cocaine—someone has said that so valuable a discovery in medicine only happens once in fifty years—the first of these local anesthetics, contained poison atoms in its molecule. Analytical chemistry eliminated these atoms, and synthetic chemistry, the wonder field of modern science, has built up a number of drugs similar in action but without the toxic dangers.

In this development of surgery, John B. Murphy took a commanding part. His pioneer work in intestinal surgery and the button he devised for intestinal anastomoses was immensely valuable when our asepsis was so precarious that speed in operation was a factor of greater importance than now. The little instrument, the button, while not now so essential, is still used and useful. Some books are peculiarly long lived, particularly those that record the mental workings of the philosopher and the poet. Many books from the great minds of Greece are as vital today as they were more than two thousand years ago, like the

Grecian marbles, they are merely mellowed by the passing of the centuries. Textbooks, on the other hand, and medical books in particular are strikingly ephemeral, but the chapter written by John B. Murphy on appendicitis still adorns American surgical literature. It is lucid, comprehensive, complete, and its reading is strongly recommended to all students of medicine.

In suppurative peritonitis the necessity for prompt opening of the abdomen and drainage for handling the tissues gently and retiring speedily and the subsequent treatment by the Murphy drip (Dr. Murphy had a sense of the dramatic and named his instruments and his maneuvers well) were also most valuable contributions. Surgeons are still grateful to him for that work, for by it he taught them to save the lives of many patients.

When I began the practice of surgery we examined the heart with a stethoscope, boiled the urine for albumin, looked at the sediment through the microscope for casts, and on our experience we estimated the patient's resistance. Today, tests of the blood, the kidneys, the liver, and heart not only render it possible to make much more accurate decisions as to operability, but medicine (and here the terms surgery and medicine are used interchangeably) is recognizing disease in the earlier stages often while it is still curable. Whole libraries have been written on blood and blood chemistry, and yet when I was a student, leucocytosis as a sign of inflammation was only mentioned. It was not until some years later that it was utilized. Based on reliable statistics, the range of operability and curability has been greatly extended in these more than three decades and the end is not yet.

To indulge in prophecy is human and pardonable, to attempt to peer into the future is in some sense a cry for immortality, an immortality which all men hope for and a few achieve. If I might so indulge, and all people of my race lay claim to some degree of second sight, I would predict, first, that our future development lies in co-operative effort, and, second, that it will be in the field of biochemistry or physiochemistry, a distinction between the two cannot be made.

Many examples of co-operative efficiency were furnished during the War. When it became obvious that poison gas was to be of prime importance, the Government called to Washington chemists but soon found that to these must be added pharmacologists and pathologists. These groups working together under one roof and to the same end achieved results in an incredibly short space of time that otherwise might not have been accomplished at all. Nor is it always necessary

for this purpose of co operation to have the resources of a government. In America, in the Mayo clinic we have the best example of correlated activity in medicine—a movement which has brought great gain to medicine, directly attributable to the clinic and has also furnished an example for co-operative effort elsewhere over the whole world. In Liverpool a group of men working together correlating results with a very meager endowment under which they were able to hire a chemist and a physicist have discovered or, if not that, have opened a trail that may lead to the discovery of a cure for cancer.

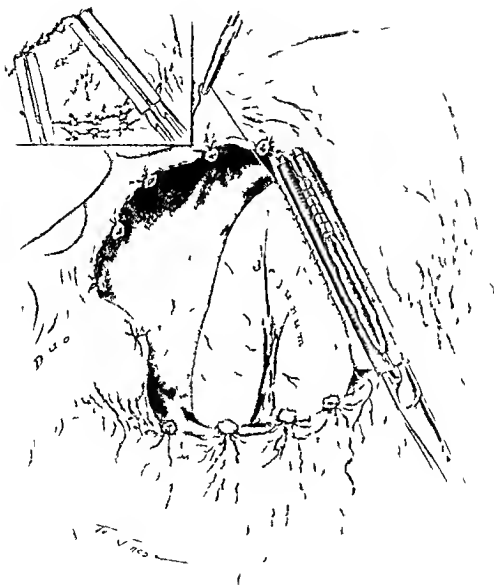
Such co-operative effort extended so as to embrace other countries might offer an explanation as to why 700 surgical beds in Cairo only offer between twenty and thirty cases yearly of appendicitis. The Egyptians have appendices but no appendicitis.

It is one hundred thousand years from the Eoanthropus or dawn man of the marlbeds of Sussex to our time. Fifteen to eighteen thousand years separate us from the men of the old stone age. It is only one hundred years from the horse drawn cannon of Waterloo to the tanks of the Marne from the Dover mail to the air mail. It is only one hundred hours from Rome to Alaska via the North Pole. Our last rounds up the ladder of civilization and down the Ages are being taken faster and faster and we may be in danger of falling off. Such falls have happened, and if others threaten the doctor must tell the statesman how to avert them. Trotter has pointed out that with all his science man the multicellular complex organism cannot save himself from the single celled amœba and has added that if steps in this

direction are not taken nature may brush man from her work table to make room for another of her tireless experiments. Perhaps this is a gloomy view, the attitude of age the depression of senility. Pennell, the artist, is reported to have said shortly before his death that women were not so good looking as formerly, and Sylvestre Bonnard, the genial old philosopher of Anatole France says to the *Asiat* who is complaining of the short comings of the younger generation 'Yes, yes. And do you know lately I've noticed my stairs more difficult to climb?

No! civilization does move and we like to believe that it moves forward, some recent historians to the contrary notwithstanding. The Greeks were great but in many directions only thinly separated from the savage and it is true that in 1456 malefactors were boiled in the caldrons of the Swine Market in Paris. Civilization must move, our profession must move both are dynamic not static, and change is life. With this in mind let me end on a sentence of Havelock Ellis. The present is in every age merely the point at which the past and future meet and we can have no quarrel with either. There can be no world without tradition, without life there can be no movement. As Heraclitus said at the beginning of modern philosophy, we can never bathe twice in the same stream but as we now know the stream runs in an unending circle. There is never a moment when the new dawn is not somewhere breaking over the earth and never a moment when the sunset ceases to die, we should greet the new dawn serenely not hastening toward it with undue speed nor yet leaving without regret the dying light that was once dawn."

LUKENS PICTORIAL TECHNIQUE
STOMACH SERIES
D RESECTION OF THE STOMACH (POLYA)



Sutures with a Reputation

Reprints of this plate may be obtained gratis by address only,
RESEARCH DIVISION, C. DEWITT LUKENS CO., 4908 Laclede Ave., St. Louis, U. S. A.

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XLIII

SEPTEMBER, 1926

NUMBER 3

LUCAS-CHAMPIONNIÈRE AND MOBILIZATION IN THE TREATMENT OF FRACTURES¹

By JOHN H. GIBBON, M.D. PHILADELPHIA

It has seemed to me appropriate in giving the Hodgen lecture to deal with some phase of the question of fractures, his name being associated in our minds so inseparably with this subject. I realize, of course, that Hodgen did much more useful things in surgery than devise a splint for fractures of the femur, in fact his life is one of those the younger generation could study with advantage. Like so many other distinguished men in surgery he founded his work on a thorough knowledge of anatomy, physiology, and pathology, and before teaching surgery he taught both anatomy and physiology. He knew too the processes of disease and what nature could do to combat them. One of the first things a student should learn and one of the last a practitioner should forget is the natural history of disease and injury, for after all, what we do in the way of treatment of most diseases and injuries is but an aid to nature's combative and reparative reactions. This statement is now here better illustrated, I hope to show you, than in the treatment of fractures, but first another word of the man in whose memory this lectureship was founded. I should like to speak of his ingenuity, a faculty so useful and sometimes absolutely essential in a surgeon. I suppose all my hearers are familiar with a story which sufficiently illustrates the fact that Hodgen was ingenious. One night before the advent of motor cars and telephones, he was called to see a patient ten

miles in the country and found himself on arrival facing a case of retention of urine with a greatly distended bladder and without any of the instruments for its relief. After a few minutes of cogitation, he asked for a broom and proceeded when it was given him, to unwrap the wire with which the straws were bound, to straighten it out and then doubling it back on itself passed it into the bladder and left his patient a few minutes later in a state of bliss, with urine gradually trickling out along the wire. Such a combination of circumstances, you may say is not apt to present itself to the surgeon of today, but any surgeon can tell you that he is often faced by situations, sometimes in the midst of an operation, which call for just this same ingenuity that Hodgen displayed.

Valuable lessons are to be learned by reading the lives and writings of men whom we are too apt to consider of no present day interest. The fallacy of such a thought is shown by the rediscoveries being published every day in our journals. Familiarity with current medical literature can never take the place of a knowledge of the history of medicine and the lack of this familiarity often places one in a ridiculous position before his readers.

My intention is to talk to you on the value of mobilization in the treatment of fractures, but I should first like to tell you of the history of this method and it can best be done by saying something of the man who developed it

¹The Hodgen Lecture read before the St. Louis Surgical Society

and who all his life made every effort to popularize it Lucas Championniere His name is so closely associated with massage and movement in the treatment of fractures that we are apt to overlook his other work, which had he never seen a fracture was enough to make him one of the outstanding figures in surgery In order to show you that this man who is responsible for all we know of massage and movement in fractures and in injuries and infections of joints was no simple manipulator or timid surgeon I propose to say a little of his other contributions to surgical advancement, contributions which raised him to the highest rank in surgery

Lucas Championniere as a young man in 1869 went to Glasgow studied under Lister in the Royal Infirmary and becoming thoroughly imbued with the value of the Listerian theory and practice returned to France an ardent advocate of antiseptic surgery He undertook the unhappy task of teaching the accoucheur that puerperal fever was due to infection and that the common source was the examining finger His accomplishment in this field alone raised him to a level far above many of his distinguished contemporaries At this time the death rate in most of the large maternity hospitals in Paris was 10 per cent Even as late as the early eighties in the hands of one of the distinguished obstetricians the rate was 3 per cent In 1878 when Lucas Championniere was made a surgeon of the hospitals and had control of a large obstetrical service he introduced there the same antiseptic practice he had established in his surgical wards and in the next 2 years had reduced the deaths to 11 in 1455 confinements and only 6 of these were caused by puerperal infection The idea of infection being carried from one woman to another by the physician was no popular one with the profession and poor Semmelweis who in 1847 first had the courage to advocate it was made a martyr But Lucas Championniere had behind him the growing knowledge of infection its prevention and arrest, and he had the satisfaction of enjoying the reward of his pioneer work Our own beloved Oliver Wendell Holmes was subjected to obliquy by preaching the Semmelweis doctrine, but in urging it he made one

of the notable contributions to American medicine

In 1876 Lucas Championniere published his *La Chirurgie Antiseptique* the first treatise on the subject in any language a second edition of which appeared in 1885 This book was translated into Spanish Russian and English the last translation being made in 1881 by Gerrish of Portland Maine Watson Chene's well known book did not appear until a year after the publication of Lucas Championniere's second edition In addition to this work he published over 75 papers on the subject and to him was largely due the credit of establishing in France the Lister methods In his teaching and writing on the Listerian theory, he always insisted that he was advocating a principle and not a new dressing for wounds After his death in 1913 an expression of appreciation of his services in the advancement of antiseptic surgery was given by Guyon president of the French Academy of Sciences who said "*En presence de la vision liberatrice que promettaient les revelations de Pasteur et les applications de Lister Just Lucas Championniere s'epreuve de l'antiseptie en de tout l'apotre et resta invariablement fidele a la methode de Lister C'est en agissant en ecrivant et en parlant qu'il a propage sa croyance fait partager son enthousiasme Aucun effort ne lui coûta pour arriver a convaincre il instruisait ses camarades ses collegues se mettait a la disposition de ses maitres Et cet effort si laborieux—on s'en etonne maintenant—se prolongera longtemps Mais sa foi etait robuste rien ne la ebranlee L'etroite surveillance des faits fut son appui*"

No such sentiment however was manifested during the early years when in advocating the new theory of wound infection and the new method of preventing and combating it this young man found himself faced by tradition and prejudice His success, however opened up to his clear, young vision the future possibilities of surgery and we find him a few years later one of the first and most determined advocates of the radical operation for hernia, an operation heretofore unjustifiable except in the presence of strangulation and even then indifferently done He was

probably the first to urge the complete removal of the sac, a step which characterized all subsequent operations, with the exception of that of Kocher. His first book of 724 pages on the treatment of hernia appeared in 1892 and contained a report of 275 operations. In 1909 he reported 1,245 radical operations. He contributed altogether 40 papers on the treatment of hernia, and his work in this field was again alone enough to distinguish him. But he became equally active in all fields of surgery. He published one of the first works on brain surgery, and was one of the early practical workers in cerebral localization. His book on trephining and cerebral localization was issued in 1877 and in addition he made some 40 contributions to this subject. He wrote 15 papers on resections of joints and reported, what at the time was an enormous number (137) of resections of the knee joint, without a death.

The early development of an antiseptic technique enabled him to enter with safety not only the brain and joints but also the abdomen, and we find him most active in this field also, contributing scores of communications on the surgery of the gastro intestinal tract, the urinary and pelvic organs. One of his notable contributions in the field of gynecology was a study of the lymphatics of the uterus, the first of its kind. In fact the time allowed for this lecture could well be consumed in enumerating his papers. Of his work in the field of fractures, I will speak later.

I have tried to show you that the man who first advised and practiced massage and mobilization in injuries of bones and joints was not a mechanic, not a "bone setter," not a man of limited surgical experience or ability, but a broad minded, intelligent surgeon, an observer and a student. He was honored by his own countrymen and by the profession in foreign countries. He was a surgeon to the hospitals Tenon (1881 to 1887), Saint Louis (1887 to 1895), Beaujon (1895 to 1898) and the Hotel-Dieu (1899 to 1905). He was president of the Societe de Chirurgie in 1894, of the Societe Obstetricale et Gynecologique 1892, of the "Congres de l'Association Francaise de Chirurgie" 1901, and of the International Society of Surgery in 1911.

This is the man, gentlemen, who so earnestly all his life advocated the abandonment of continuous and prolonged fixation in fractures and the substitution for it of early and regulated massage and movement. My excuse for bringing this subject to your attention is that I think the good work which Lucas Championniere did has in recent years been forgotten and I know that the value of the principles enumerated by him has not been generally taught in our medical schools.

The author of this method of treating broken bones arrived at his conclusions gradually and after years of careful observation and study, "*L'etrote surveillance des faits fut son appui*," and the things he saw and noted can be seen today by anyone treating fractures. His conclusions were an evolution of his observations and not theories based on imagination. Unfortunately, as is so often the case with new things, massage and mobilization were taken up in some places by enthusiastic cranks, too often devoid of surgical training and experience, which did much to discredit the method. However, Lucas Championniere taught one thing that will never be forgotten and that is that restoration of function is the most important object in the treatment of fractures. Forty years ago he began to teach that absolute fixation delayed union and resulted in incapacity and that graduated movement and massage encouraged the formation of callus and hastened restoration of function. He published 2 books and some 35 papers on mobilization in injuries of bones and joints. His first paper appeared in 1879 and his last book "*Precis du Traitement des Fractures par le Massage et la Mobilization*" in 1910.

At the time he began his work, the rule, which was as ancient as time, was to reduce the fracture and apply a fixation dressing, which should not be removed until union was complete or if from necessity it had to be changed, care was taken to see that no movement whatever should be allowed, since it might cause displacement and would certainly interfere with the formation of callus. Therefore, in recommending such a revolutionary change, Lucas Championniere was confronted by as much opposition as he met in advocating

antiseptic surgery, the application of antiseptic principles in maternity hospitals and the radical cure of hernia. Opposition was not new to him and seemed only to stimulate him. I suppose that an unfortunate egotism which pervades all his writings had its origin in this opposition. It may of course be that each fed the other.

I should like to call your attention to two misconceptions in regard to the Lucas Championniere method: first that he used unlimited movement or unintelligent massage; and second that all fractures were treated without fixation. On the contrary he always emphasized that both massage and mobilization must be dosed to suit the individual fracture and in one fracture at least he practiced open fixation: that of the patella when there was a separation of the fragments. About the time of the beginning of the late war it looked as if surgeons everywhere had forgotten entirely everything that Lucas Championniere had ever taught regarding the healing of broken bones for notwithstanding the occasional remonstrance of a few absolute fixation with plates, wires, screws and casts was everywhere being practiced. The wide experience of the surgeons of all countries during the war soon demonstrated that this practice meant too often permanent incapacity and since the war about one fracture is operated on to fifty before the war.

When the Belgian surgeon Willems brought out his treatment of infected joints following gunshot injuries which consisted of incision but no drainage tubes and free and full movement it was looked upon as a revolutionary change but Lucas Championniere had practiced very much the same thing many years before. In 1879 he presented a long communication on the subject before the Société de Chirurgie and reported a case of compound fracture of the elbow successfully treated by mobilization in 1877 and a number of cases operated on for foreign bodies in the joints and for suppurative arthritis in which mobilization was employed with excellent results. In this paper he advanced the principle of mobilization in all joint fractures.

I suppose all surgeons the world over employ movement and massage much earlier

than was the rule when Lucas Championniere began to write on the subject, but there still exists a timidity about the use of these valuable aids until after union is complete and then they are administered by some one who knows all about massage but little or nothing of fractures and their repair. For twenty years I have taught medical students that passive movement should be commenced as soon as it can be done without danger of disturbing the fragments and that massage can be given in all fractures from the beginning of their treatment. Following this rule in regard to movement, I have been surprised at the improved results and am able to confirm much that Lucas Championniere has said. For instance some of the best functional results obtained in fractures of the neck of the femur which I have seen have occurred in old people, who for some reason have been unable to stand confinement in bed and have been kept in a chair all day with no attention paid to the fracture.

I think few of us have used massage as directed by Lucas Championniere. I certainly have not. He shows very clearly that a gentle massage never deep enough to give pain begun below the injury and avoiding the site of the fracture carried well above it, produces both anæsthesia and relaxation of muscular contraction so that after a day or two the reduction which is necessary is much more easily accomplished. He says that graduated massage and mobilization hasten rather than retard the formation of callus. So true is this that in children where there is usually such quick and abundant formation of callus, massage is rarely employed except very superficially for its soothing effect before making movements. He lays great stress on the fact that massage should never be given immediately over the site of fracture.

The pathology accompanying many fractures is not confined to the bone alone and it is a mistake to direct our treatment to this one factor. Function after all should be our main object and the structures and joints adjacent to a broken bone need as much attention as the bone. Who has seen an animal or a bird with an ununited fracture or one in which Nature has failed to restore, in large part, the

function? And on the other hand what surgeon has failed to see delayed union or non union after perfect reduction followed by prolonged and absolute immobilization? Even the most ardent advocates of plating recent fractures have had to admit that such absolute fixation is a common cause of delayed union. Of course, this is not true when massage and movement of muscles and joints constitute a part of the after-treatment. Lucas Championniere very properly observes that the perfection of function depends less on the exact line of the bone than on other conditions, such as the suppleness of the muscles and soft parts, the mobility of the joints, the good condition of the tendons, nerves and vessels, the vitality of the part and the power of the muscles. The common error is made of supposing that those who advocate movement in the treatment of fractures pay little attention to reduction of the deformity. This is not the case, nor was it the practice of Lucas Championniere, for no surgeon of experience could ignore the fact that much permanent disability arises from neglected deformity, or that the reduction of deformity is one of the important factors in the restoration of function. However, we often think we have reduced a fracture when we have not, and then depend upon a splint or cast to do the rest. The lightest and most easily removed apparatus should be the rule and only exceptional fractures, such as those of the shaft of the femur and some of those of the shaft of the humerus, require an absolutely immobilizing fixation. The best dressing is always that which permits massage and some movement of muscles and joints.

One of the fractures about which we deceive ourselves is that of the clavicle. It is nearly impossible by any method to reduce the deformity or to control it by any dressing. Lucas Championniere claimed that by massage over two or three days, the muscular contraction, which is largely responsible for the deformity, can be overcome and reduction made and maintained by the simplest dressing. The method which has given us the best results is a simple figure of eight bandage about the shoulders which holds them as far as possible away from the sternum and a sling for the forearm, one wing of which passes over

the uprising inner fragment. I have had several excellent results when the sling alone was used. Dressings which fix the arm are uncomfortable, inconvenient, and accomplish nothing. Wiring or plating of the clavicle should never be done. The recumbent position is the worst possible for fractures of the clavicle. Lucas Championniere makes an interesting observation in regard to jockeys. He noted that although fracture of the clavicle is a very common injury among them, they rarely put themselves in the hands of a physician, but simply carried the arm in a sling and began riding as soon as the pain permitted. On examining many, he found much deformity but never nonunion or enough pain to interfere with riding.

What has been said of the clavicle is equally true of the elbow. Why is it that one sees so few stiff elbows now after fractures of the lower end of the humerus and of the head and neck of the radius? It is because Sir Robert Jones demonstrated years ago that by employing acute flexion with mobilization, much better results are obtained than by using splints and casts. Mobilization has been pretty generally accepted in the case of fractures of the elbow and its use needs to be extended to other regions. It is remarkable how properly applied massage and movement can be used without affecting the position of the fragments, and how little motion of a joint, if begun early, is required to prevent subsequent stiffness. The massage is a comfort and neither it nor the movement should ever cause pain. Too much stress cannot be laid on the importance of avoiding movements which produce pain.

Much of what I would like to say can be illustrated in the treatment of a Colles' fracture. Reduction should be made in any case of deformity, but if to retain it there is applied a dressing which confines the fingers and which is not changed for a week or ten days, then any movement is painful and restoration of function is sure to be delayed. If, on the contrary, massage is given daily and a little movement of the fingers and wrist made at each daily dressing, the function is never lost. The movements, it goes without saying, should be normal. For instance, complete flexion of the

wrist and fingers at the same time should not be attempted. It is a painful movement in a normal wrist and hand. Extension or dorsal flexion of the hand should not be made until the fragments are fixed because it tends to reproduce the deformity. I have found that complete flexion of the fingers and a fair degree of movement of the wrist can be made in a Colles' fracture from the beginning with little pain and with no danger of disturbing the fragments and also that in this fracture too one can permit active movement much earlier than in many others, in fact the patient is urged to move his fingers from the beginning of the treatment. To apply a cast or other immovable dressing to a Colles' fracture is never necessary and is in fact the surest way of inviting trouble for in such a case there will certainly be prolonged disability and great suffering later in the attempts to restore use. It makes little difference what kind of a splint is applied so long as the hand is held to its ulnar side and the fingers are not confined. In dressing these fractures and when making movement and giving massage we should support the part under the wrist and forearm and the hand should never be extended. If I should suffer a Colles' fracture I would have no splint after reduction but simply carry the part in a sling which supported the wrist and allowed the hand to rest in flexion and abduction. In any case there is little danger of recurrence of deformity after two weeks and the splint can usually be discarded about this time with careful instruction to the patient as to the extent and character of the active movements which he should make. We have treated hundreds of these fractures in this way and the results have been infinitely better than when the older method was used.

We have practically discarded the uncut irremovable plaster cast in the treatment of fractures. In fractures of the upper extremity I am sure they do much harm and accomplish nothing that cannot be obtained by less objectionable dressings. In fractures of the bones of the leg no cast is ever employed until the patient is to be got out of bed and then the cast is light and cut so that it can be easily removed for massage and movement. The

cast is used in these cases largely to protect the part against further injury. If for some reason the patient is kept in bed until union is complete, no fixation of any kind is used when he gets up. In the worst fractures of the tibia and fibula massage and movement of the adjacent joints constitutes an indispensable part of the treatment and should be begun within a day or two of the injury.

The only fracture which we habitually subject to open operation is that of the patella with separation of the fragments and this is done because in no other way can we remove the tendinous tissue which interposes itself between the fragments. In the operation the bone is never traumatized but the fragments are approximated by sutures in the ligaments and tendon and occasionally by an encircling suture. Another reason for operating on these fractures is that operation permits earlier movement and a fuller and quicker restoration of function. I have gradually diminished the time that the splint is used in these fractures until now the splint is removed on the second or third day. Movement of the patella and slight movement of the knee joint are begun at once. Fractures of the patella without separation of the fragments such as occur from direct force can be treated exactly like those which have been operated upon.

Fractures of the bones of the face, including those of the mandible as a rule are better treated by daily moulding than by fixed apparatus. The advantage of the interdental splint properly made and applied in certain fractures of the jaw is undeniable but in the hands of the inexperienced and untrained infection with all its unpleasant sequelæ is apt to follow its employment. We have had a number of bad fractures of the mandible treated by simply forcing repeatedly the fragments into position. The patient himself can be easily taught to carry out the necessary manipulation and if he does it a number of times a day it is remarkable how soon and how easily the fragments come back to their normal relationship. The operation of wiring the fragments in these fractures is frequently followed by infection, necrosis and delayed union. These complications are never seen when the moulding method is employed.

because the hygiene of the mouth can easily be carried out. The external splints usually employed in these cases are uncomfortable, often painful, and do little to maintain reduction. I used them conscientiously for years, but long ago discarded them for the reasons just given. The fixation methods are most unsuited to infected fractures of the jaw. Better drainage and a prompter clearing up of the infection takes place when moulding is employed. I have seen several cases, in which external drainage seemed inevitable, clear up without it under this treatment.

What has been said of the jaw applies equally to fractures of the nose. To maintain reduction in these cases by means of the absurdly complicated external splints or of the hard unresisting internal splints is only to invite ulceration and necrosis of the already traumatized soft tissue. Here again daily moulding supplemented by the proper pressure frequently applied by the patient himself, will give far better restoration of contour. Of course, in these cases it is just as important to restore the internal contour as the external outline, but this too can be done best by moulding with the finger or an instrument protected with rubber. Where there is marked depression and obstruction of the nares, a pack of gauze thoroughly impregnated with sterile vaseline left in place for about 48 hours and gradually removed is much better and less harmful than the rigid nasal splints. Dry gauze should not be used as it interferes with drainage and blocks up secretion. The pathological situation is not at all that which is present when the rhinologist corrects an obstructed nares months or years after a fracture and when the internal splint is used. In the recent fracture the soft tissues are traumatized and inflamed and pressure means necrosis.

I realize that what I have said about these fractures of the bones of the face will not appeal to those who have always employed some form of fixation, but I would suggest that they discard the stereotyped method and try moulding in a few cases. My opinion has been formed gradually after no small experience.

The question of general anesthesia as an aid to the reduction of fractures is another

matter in which experience has brought about a great change in our practice. With very few exceptions general anesthesia is rarely used. It does away, it is true, with the great obstacle to reduction, namely muscular contraction, but this is only temporary and how many of us have seen deformity recur promptly after we had reduced it and thought we had applied a dressing which would maintain it? Sometimes the deformity recurs before the patient has recovered consciousness. The muscular contraction can be overcome by traction or by massage and the deformity reduced gradually or with the use of very little force, and recurrence of deformity can be prevented by the same means. Do not understand me to mean that general anesthesia can be discarded or that deformity recurs generally after its use. I do mean however, that the general anesthetic is often unnecessary and many times a delusion and a fracture reduced without it with the aid of massage or traction is far less apt to become redisplaced.

Employment of general anesthesia in the mobilization of joints and muscles after the fracture has healed is to be condemned. A little movement be it passive or active without an anesthetic is worth much more than a great deal of movement under an anesthetic, with its resulting inflammatory reaction and pain which makes early subsequent movement impossible. Active movement at this time cannot be too forcibly urged on the patient and he should not be allowed to get the idea that the surgeon, the masseur, the electricity, the baking or the particular lubricant used will restore his function, but rather must he be impressed with the fact that active movement and use of all of his muscles is the most important part of his treatment. Nothing so much as use brings back function and overcomes atrophy of muscles and bones. This fact needs to be impressed on members of compensation boards, and if the employee does not do his part, the most important, in restoring function, his compensation should be reduced, for without some co operation on the part of the patient, a permanent disability can be developed after nearly any fracture. This, to my mind, is another reason for never allowing the function to be lost from prolonged immobiliza-

tion. Function like fortune is easily lost and hard to regain. Too often in fractures which are difficult or impossible to reduce, we get both permanent deformity and permanent loss of function. The rule should be that as soon as it is apparent that deformity is inevitable, attention then should be devoted entirely to the preservation of function.

The massage of Lucas Championniere is not massage as we know it and as it is practiced by the ordinary professional masseur, but it is a much gentler procedure consisting largely in a soothing stroking motion in the direction of the venous flow. Hey Groves in his excellent book on fractures has designated this method of treatment by the term "hypnotism," not a satisfactory one but it suggests that anæsthesia which the proper application of the massage produces. This treatment should be given by the surgeon and not by a masseur especially during the early days. In England the treatment has been extensively employed especially by Mennell and his followers and those interested in the subject I would refer to Mennell's book. The chapter on massage and mobilization in Croves' book should be read by everyone undertaking to treat fractures. The report of the fracture committee of the British medical association showed very definitely that far better functional results were obtained in many fractures by mobilization than by the old fixation plan.

In view of the fact that we have largely continued to treat fractures according to principles which are as old as medicine, I make no apology for concluding with a quotation of some of the principles laid down many years

ago by Lucas Championniere, or for asking you to consider them in the light of your personal experience.

It is not immobilization which favors the formation of callus, but movement.

The movement which favors the development of callus is not just any movement, but one regulated to suit the individual fracture for movement can be made to arrest its formation or to exaggerate it.

Immobilization is always a condition unfavorable to the vitality of the part.

Immobilization is not the only remedy for the pain which accompanies a fracture.

Pain may find even a better remedy in a certain form of movement.

Far from being the only and inevitable factor in the treatment of fractures immobilization is but one factor and one often secondary in importance or even unnecessary.

My main object in bringing this subject before you is that I do not think that the subject of fractures is given the place in the curricula of our undergraduate schools that its importance deserves. The recent graduates know too much about the operative treatment and not enough about the pathology, the repair and the principles which should underlie the treatment. The subject is too often taught by the exhibition of a few cases and the performance of operations for the correction of deformity or the restoration of function—deformity and loss of function which in many instances should never have occurred.

The time to overcome deformity is in the early days of treatment and the time to begin the restoration of function is at once.

RESECTION OF STRICTURE OF THE SUPERIOR RENAL PELVIS
FOR RELIEF OF PARTIAL HYDRONEPHROSIS

LOCALIZED pathological conditions in the substance of the kidney requiring correction by surgery are almost invariably dealt with by the complete removal of the organ. It is interesting to note that in the earlier days of renal surgery partial resection of the kidney was frequently practiced. Czerny in 1887 was the first as far as I can determine to perform a resection of a kidney; thus he did for tumor. A little later Kuemmell resected the lower part of the organ for echinococcus infection. Kuster reviewed the literature and collected 30 cases of partial resection, tuberculosis and tumor, hydronephrosis and stone being the conditions found. The results of such surgery were evidently not satisfactory for the majority of these conditions, and nephrectomy became the operation of choice for their correction. The operative mortality of partial removal was strikingly low in comparison to that of complete removal of the organ, the former being 16 per cent, the latter as high as 30 per cent. In recent years surgeons have reserved partial renal resections for a selected group of cases with localized pathological processes which from their nature demonstrated a tendency to remain stationary and not to progress either locally or generally, and have used complete excision for such conditions as tuberculosis and tumor.

The trend of modern renal surgery is toward conservatism and I feel that it may be stated without fear of contradiction that in practical life every surgical kidney disease aside from tuberculosis and tumor, urological surgeons have gradually accepted a more and more conservative attitude, and as a result have saved many kidneys which would have been removed. A number of articles on the subject of partial resection by very prominent surgeons and accurate observers have recently appeared; therefore an outline of the progress of this feature of renal surgery can be elimi-

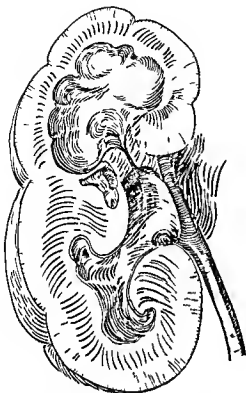


Fig 1 Drawing showing lesion

presenting today. The condition was corrected by a type of conservative surgery of the same character as the present one. The former was the resection of a renal pyramid obstructed by an inflammation and calcareous implantation of the papilla with a resultant cystic retention. The present one deals with the resection of a dense stricture of the superior pelvis of the kidney for the relief of retention.

The patient, a young woman in the late twenties, nurse at the Barnes Hospital, St. Louis, complained of a constant aching pain high in the back on the left side. She had for years suffered with frequent attacks of tonsillitis and had been a patient in the hospital several times for respiratory conditions. In April 1920 following a succession of renal colics on the left side, I removed a stone about the size of a grain of corn from her upper left ureter by ureterotomy. She made a quick and uneventful recovery. Following this occasional dilatation of the ureter and lavage were done to prevent recurrence.

The patient was perfectly well without renal symptoms until the fall of 1924, when she was seized with severe renal colic on the left side which lasted about 8 hours. She described this pain as being located higher in the back than her former attack and well up under the ribs; this pain did not radiate

along the ureter. A catheter was passed in the ureter and practically no retention was found in the renal pelvis. She complained of a constant ache for almost 3 weeks. In the meantime repeated roentgenograms plain and with catheters in place failed to show a definite stone, although on one picture there was a vague indistinct shadow which was quite suggestive. Immediately after the attack there were no red blood cells found in the urine; the patient ran no fever; the leucocyte count was normal and the blood nitrogen and differential phthalein was perfect. Repeated pyelograms were made which showed a condition quite similar to that described by Lower and Belcher with the catheter stopping below the ureteropelvic juncture. On several occasions it was noticed that the lower part of the pelvis would fill whereas the upper part was always indistinct, particularly in the region of the juncture of the upper and lower pelvis. On one occasion only were we able to get the catheter into the superior calyx; the pyelogram at this time showed an entirely different picture. On this occasion there was dilatation and complete filling of the upper pelvis and its calyces with absolutely no flow coming back into the lower pelvis. Moderate hydronephrosis was shown in the superior calyx. In other words, the constriction was so pronounced that regurgitation around the catheter was withheld. On filling this upper calyx the patient's high pain was typically reproduced.

On January 7, 1925, I exposed her left kidney for probable soft stone blocking of the infundibulum of the upper calyx. When the kidney, which looked perfectly normal, was freed, a definite band of adhesions could be seen around the ureter at the site of the previous ureterotomy. These were freed and there was found no evidence of stricture of the wall of the duct. The pelvis was opened but showed no hydronephrosis; it was explored for calculus with negative findings. It was noted that the entrance from the true pelvis to the upper superior part was decidedly constricted so that it would not admit the tip of my little finger. It felt like an annular band. I could not even introduce a small stone forceps through this opening which was very fixed and rigid. A partial nephrotomy was done over this region in the upper part of the kidney, the kidney being opened down into its pelvis. The upper part was moderately dilated but still retained a very healthy cortical substance. When a finger was inserted in this upper dilated part of the pelvis, it was found that the 2 fingers could not be approximated though there was no stone present, even the fluoroscope in the operating room failed to reveal a shadow. The inability to enter the upper pelvis from below, or vice versa, was due to the dense scarring at least $\frac{1}{4}$ inch in length and about the same in thickness. This resembled a leioid surrounding the entrance to the upper pelvis. The opening through the center of this scar would scarcely admit a No. 8 catheter. On free exposure this mass of scar was thoroughly identified and by temporarily cutting off the blood supply by pedicle control the scar tissue was resected by knife until

the pelvis from below would admit my index finger. The surrounding walls seemed soft and pliable. There was very slight bleeding, one or two vessels had to be clamped and tied. It seemed evident that all of the scar had been removed, and that drainage was free to the pelvis of the kidney.

A rubber tube was inserted through the nephrotomy incision down into the pelvis through this resected area, the pelvic incision was closed after I had determined that a large bulb would pass easily down the ureter without signs of obstruction, and the kidney closed around the tube. The patient passed through an uneventful convalescence and was soon back on duty.

Since the operation there have been several pyelograms made which show that the kidney pelvis fills, there is no retention in the pelvis the patient has

been well and has not suffered a recurrence of contraction of this pelvis up to this time. I therefore trust that this operation may prove completely and permanently successful. I believed at the time that with the process so localized and apparently so easy to remove it was certainly worth an attempt to save the upper part of this kidney which was so well preserved.

BIBLIOGRAPHY

- Judd E. S. Partial resection of the kidney. *Ann Surg* 1923, **LXXVII** 458.
 Young H. H. Resection of the kidney in nephrolithiasis. *Surg Gynec & Obst* 1914, **LXXVIII** 10.
 PETERS Beitr z Klin Chir 1923, **CXXIX** 716.
 Lower and Belcher. *J Urol* 1924, **VII**.
 Eisenbrath and Linder. *J Urol* 1925, **VIII**.

HÆMANGIOMA OF THE UTERUS

REPORT OF A CASE

By FREDERICK W. WRIGHT, M.B., BALTIMORE, MARYLAND

Revised by CHU HILL, M.D., BALTIMORE, MARYLAND

HÆMANGIOMA of the uterus is very rare. Our patient had been admitted to the hospital on account of gall stones and it was only during the routine examination that the uterine tumor was discovered. A hysterectomy was done and was immediately followed by an appendectomy and the gall bladder operation.

Cavernous hæmangioma of the type found in this case presents as its main characteristic a series of anastomosing vascular channels enclosed by thin septa. Large cystic dilations may occur which are filled with blood or serous fluid. The tumor slowly enlarges by distention of the original vessels and formation of new vessels until anastomoses with large arteries or veins may become established and severe hæmorrhage may occur. Sometimes a capsule forms about the tumor and the growth remains stationary.

The patient, a white woman 38 years of age, was admitted to the Church Home and Infirmary October 1, 1924. The following history was obtained. The complaint was pain in the pit of the stomach. The father was alive and well. Five sisters and two brothers were all living and well. The mother had died of diabetes. The patient had 5 children, the delivery in all cases having been normal and spontaneous. Her menses began at 12 years. They were regular, occurring every 28 days and lasting 4 to 5 days. The flow was moderate. There never had been any intermenstrual bleeding. The last period began on September 25 and lasted 4 days. It was normal in every respect.

Patient's general health has been good. There never has been any long illness of any kind, no loss of weight nor any marked general disturbance. In 1918 she had a mild attack of influenza which kept her in bed for one week. Her recovery from this was complete. In recent months she has had some palpitation accompanied by precordial pain. This pain would waken her at night but subside as a rule in about an hour. She had no oedema of the ankles nor dyspnoea. She had some indigestion following meals which she described as a burning sensation. In March 1917 she had a very severe pain in the upper right quadrant of her abdomen which radiated to the back and up to the right shoulder. She subsequently was jaundiced and passed some bile in her urine. She

has had obstinate constipation at times. There is no history of any urinary symptoms.

In July 1924 she had a very severe pain in her upper abdomen. She became nauseated and vomited. Following this her stools became lighter in color. Since then and until admission she has had a somewhat similar attack almost every week. The last occurred September 20, 1924, and this one was accompanied by a chill. The pain became very severe, morphine being required to allay it.

Physical examination. The patient is a moderately obese woman who is apparently not acutely ill. The examination of the head, neck, and cardiorespiratory system is negative. There is tenderness over the gall bladder but no mass is palpable. Otherwise examination of the abdomen is negative. On pelvic examination the vaginal outlet is moderately relaxed. The cervix is normal. To the right and slightly posterior to the uterus is a cystic tumor. It seems to move with the uterus. The uterus proper seems to be normal in size. The urine and blood count were normal.

X-ray report. September 17, 1924. Gall bladder region. Well below the costal margin is a faint rounded shadow about as big as a small egg. This may be a fecal mass but would also suggest a thickened or distended gall bladder. No definite shadows are outlined that would suggest the presence of stones, although the history points strongly to this condition.

The pre-operative diagnosis was chronic cholecystitis, cholelithiasis and a tumor of the pelvis.

Operation. (Dr. Cullen.) It was deemed advisable to deal with the pelvic condition first. The abdomen was opened through a low midline incision. The patient was put in the Trendelenburg position and the intestines packed off with wet gauze. A mass, the projecting portion of which was about 4 centimeters in diameter, was found in the right broad ligament. It was of a rubbery consistency and intimately associated with the uterus. The broad ligament was incised and the tumor proper exposed. It was found to be very vascular and any attempt to separate it from the uterus started marked hæmorrhage. On further investigation it was found to form almost a part of the wall of the uterus. A supravaginal hysterectomy was performed, the tumor and the uterus being removed without disturbing their relationship. One ovary was saved. The appendix was removed. Several stones were removed from the gall bladder.

Pathological report. Johns Hopkins Gynecological Laboratory No. 29775. The uterus is about average size and has been amputated above the cervix. It is



Fig 1 The hemangioma is attached to the right and lower segment of the uterus. The broad ligament has been removed so as to show the tumor proper. Insert shows tumor proper and point of attachment as it lay between the folds of the broad ligament.

6 centimeters long and 5.5 centimeters broad at the fundus. The contour is quite smooth and the body is firm and slightly harder than normal. On section the uterine musculature seems slightly thicker than normal. No myomata are present. The cavity is normal in size. The endometrium is firm granular, and everywhere intact.

In the right broad ligament below the tube and ovary and intimately attached to the right side of the uterus is an oval mass measuring 10.5 by 5.5 by 5 centimeters. It is bluish black in color smooth and glistening. It is of a soft rubbery consistence. On section it seems to be made up of large cavernous blood vessels filled with coagulated blood. The right tube is slightly thickened and there is a well developed secondary ostium about 2 centimeters from the fimbria. The ovary is small and contains a number of large follicular cysts.

Microscopic examination shows large blood spaces filled with blood elements the supporting structure being connective tissue forming trabeculae.

Reder (1) has described a case of angioma of the uterus, the predominant and alarming symptoms being hæmorrhage so profuse as

almost to deplete the patient. At operation a tumor was found which he describes as looking like a red tomato, it was soft and to the touch suggested a cyst. Reder punctured the tumor which he thought to be cystic and experienced great difficulty in controlling the hæmorrhage. Clarke and Bell (2) reported a case which on examination showed a round movable tumor in the left iliac fossa reaching nearly as high as the umbilicus. At operation this proved to be a myoma but in the wall of the uterus itself, on the right side, they found a large soft mass suggesting a cyst and not unlike an early pregnancy. This proved to be an angiomatous fibromyoma of the wall. Siegel, Delaval, and Marie (3) report a case in which a small hæmangioma was found on the anterior wall of the uterus. In this case, as in Reder's, the alarming symptom was hæmorrhage and a supravaginal hysterectomy was done. MacCallum (4) says "The cavernous hæmangi-



Fig. 2. A low power study of a section of the tumor showing the large blood spaces with the supporting trabeculae of connective tissue

oma of the liver constitutes perhaps the best studied type. They are found as a rule at autopsy without having given rise to any symptoms and may be very small or reach a diameter of several centimeters. On section they appear as deep purplish red sharply outlined areas from which dark blood can be squeezed or mashed out leaving a greyish white spongy framework. MacCallum goes on to say: 'Microscopically the framework is seen to enclose quite large spaces which open into one another and which are evidently interposed between artery and vein. They are lined with endothelium and do not seem to communicate with the adjacent capillaries although some of them extend into adjacent liver substances. He also adds: 'In all these angiomas circulatory disturbances can occur. Infection may cause an inflammatory reaction in their substance. Thrombosis of the blood channels is common and phleboliths may be formed. Kelly and Cullen (5) in 'Myomata of the Uterus' (p. 159) picture a large myoma with many areas of angioma scattered throughout it. They also give the

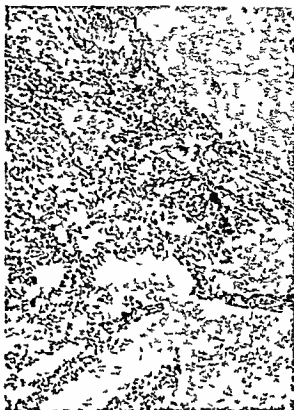


Fig. 3. High power study of a section of the tumor. The blood elements in the large blood spaces are seen also the trabeculae of connective tissue which form the supporting tissue of the tumor

histological pictures of one of these angiomatous areas. They have noted 3 cases of angioma in their series of 1,674 myoma cases.

In the case here reported there were no symptoms referable to the hemangioma but in 2 of the cases found in the literature there was alarming hemorrhage. Cavernous hemangiomas of the uterus are rare but in certain cases give rise to symptoms which require prompt surgical intervention.

I am much indebted to Dr. Thomas S. Cullen for his kind assistance in and the privilege of reporting this case.

BIBLIOGRAPHY

1. REDER, F. Specimen of angioma of the uterus. *Med. Fortnightly*, 1904, LXX, 58-59.
2. CLARKE H. H. and BELL W. B. *J. Obst. and Gynec. Brit. Imp.* 1906, LX, 348.
3. SIEGEL DELAVAL and MARIE. Angiome utérin. *Bull. et mém. Soc. anat. de Paris* 1906, LXXX, 403.
4. MACCALLUM. *A Text book of Pathology*, pp. 963-6.
5. KELLY and CULLEN. *Myomata of the Uterus*. Philadelphia: W. B. Saunders Company 1909, p. 159.

POTT'S ABSCESS

By T. A. WILLIS, M.D., F.A.C.S. CLEVELAND, OHIO
Anatomical Laboratory Western Reserve University

A CENTURY and a half ago Percival Pott described how his attention was focused upon the disease which has since borne his name by "an affecting instance of this distemper in the person of a very promising youth fourteen years old with whose family I was nearly connected." Contemporary opinion held the paralysis to be the result of the kyphosis which in turn was due to traumatism, but Pott insisted that "some predisposing cause at least must be looked for, in which consists the very essence of the disease."

That the young man regained use of his legs after a seemingly accidental abscess near the part, became "a subject of frequent though not very satisfactory contemplation" resulting however, in the conclusion that there was some predisposing factor in the disease and that effect had been mistaken for cause. Having conducted the autopsy, Pott described the changes in ligaments, bones, and cartilages as we know them today in the gross pathology of tuberculous spondylitis. Other than bacteriologically little of value has been added to this description as published in 1779 (1).

Pott described the disease in its late stage with kyphosis and paraplegia. More recent studies have resulted in earlier diagnosis and for this the X ray has been of prime importance, but as with other useful laboratory adjuncts there has arisen a tendency to depend too much upon the evidence obtained from this single source. Certain characteristics shown in so called typical cases of tuberculous spondylitis have been accepted as necessary to its diagnosis, while the presence of other X ray findings has been considered sufficient to rule out the disease.

A typical tuberculous spinal lesion involves vertebral bodies and discs only. Until recently X ray evidence of Pott's disease consisted of thinning of an intervertebral disc and crushing of one or more bodies, with or

without abscess formation, and diagnosis was delayed until such destructive changes were apparent. With improvement in apparatus and technique it has been possible to observe earlier changes. Jones and Lovett (7) define the essential pathology of Pott's disease as tuberculous infiltration of the anterior part of the vertebral bodies, involving later the intervertebral cartilages but rarely affecting the laminae, spinous, or transverse processes. Whitman (10) states that the "first indication of the disease is usually found in the anterior part of the vertebral bodies just beneath the fibroepineurial layer of the anterior longitudinal ligament."

In other instances the process may begin in the interior of a vertebral body, most often in several minute foci near the upper or lower epiphyses. Occasionally the disease advances beneath the anterior ligament without implicating the substance of the bone deeply, a form of tuberculous periostitis, spondylitis superficialis."

A tuberculous lesion is typically destructive. Bone formative changes have been considered pathognomonic of nontuberculous disease. Baetjer and Waters (1) give the differential points between X rays of tuberculous and non-tuberculous disease of the vertebral column as follows: "In non-tuberculous cases there is found (1) no angulation, (2) no lateral deformity, (3) bone production, (4) no obliteration of joint spaces, (5) the condition occurring at any age according to the type of infection. In tuberculous cases are found, (1) angulation, (2) posterior deformity but not lateral deformity as a rule, (3) no bone production, (4) obliteration of the joint space and involvement of the body, (5) the condition occurring most frequently in children and young adults." Again we find these authors stating "If this disease (tuberculosis) is present there is angulation, anteroposterior deformity, and no new bone formation."

Fraser (5) states "In tuberculosis of the vertebrae the periosteum rarely forms any



Fig. 1 Abdomen of No 1084 male negro 24 years of age. 1 Omentum reflected thickened covered with tubercles. 2 Small intestine potted with tubercles no adhesions. 3 Parietal peritoneum tubercles no adhesions. 4 Lower parietal peritoneum adhesions. 5 Postmortem opening through adhesion into bowel. 6 Torn adherent edge of thickened omentum behind this: an area free from adhesions. 7 Liver adherent to peritoneum.



Fig. 2 Lowest abscess in No 1084. 1 Parietal walls held back no abscess anterior to exterior. 3 Intervertebral disc below third lumbar vertebra. 5 Intervertebral disc below fifth lumbar vertebra. Note entire loss of fourth lumbar disc.

degree of new bone. Campbell (2) describes 4 cases of vertebral disease showing lamellæ of bone bridging the intervertebral discs but is not convinced that the lesions are tuberculous. Coheld however (3) in a hundred tuberculous spines found 10 showing hypertrophic changes. These were all over 20 years of age and all the foci were in the mobile part of the vertebral columns. The Wassermann reaction was negative in each of the 10 and there was no evidence of mixed infection in the majority of them. In a later paper Coheld (3) described another case of this sort and showed photographs of the ankylosed lumbar vertebrae. Tubercle bacilli were obtained from this abscess and no mixed infection was found.

A tuberculous spinal lesion is typically single. Peabody (8) in 1922 found but one

reference to multiple foci in the literature of the preceding 10 years. This was by Whitman, who reported more than one focus in 16 out of 1356 tuberculous spines. Peabody however found 13 instances of multiple foci in 315 tuberculous spines and considered this percentage (4.1 per cent) is too low because the discovery of the second focus had been by chance; the films showing only small portions of the columns examined. In each of his subjects the lesser lesion, presumably the secondary focus, was at a lower level than the primary.

The anatomical laboratory provides in some ways opportunity for close and detailed study of Pott's disease. The condition can be recognized early in dissection even though it is not known at the beginning; the specimen can be thoroughly examined and successive stages of the work can be roentgenographed or photographed. Four such bodies recently



Fig. 3 Radiogram of abscess of Figure 2. Note calcified lamellae in walls and subluxation through loss of fourth lumbar disc. Anteroposterior view and lateral view.

provided data which seem particularly instructive in the light of the opinions outlined here.

In none was there known history of syphilis or gross evidence of this disease. The four cases are the following:

No 1084, male negro, 24 years. No 1110, male negro, 31 years. No 1178, male, white, 73 years. No 1204, male, negro, 22 years.

No 1178 shows a single, apparently healed tuberculous lesion involving the bodies of the twelfth thoracic and first lumbar vertebrae with a small caseous abscess.

No 1116 shows a single active tuberculous lesion involving the bodies of the third thoracic to the first lumbar and the heads of many ribs, the entire area being surrounded in front by a fusiform abscess with numerous pockets giving it a mottled outline.

No 1204 shows a single active tuberculous focus involving all five lumbar vertebrae and the sacrum.

No 1084 shows four lesions in the vertebral column involving severally the first, second, third and fourth cervical vertebrae; the second to eighth thoracic; eleventh thoracic to first lumbar; and third lumbar to first sacral. In addition there is a cold abscess in the manubrium.

To avoid tedium we shall describe the condition in No 1084 in detail and make allusion to the outstanding features in the other cases.

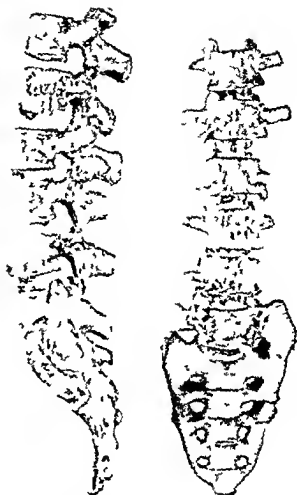


Fig. 4 Lumbar and sacral vertebrae of No 1084. Ventral and left lateral aspects. Note the amount of erosion of articular and transverse processes and neural arch in general. Left pedicle of fifth lumbar is completely eroded.

Cadaver 1084 is that of a negro male, 24 years of age, dead of pulmonary tuberculosis. Tubercles were also noted in the omentum, parietal peritoneum and small intestines (Fig. 1). There were no external sinuses. When the skin of the back was removed, a sinus tract appeared to the left of the cervical midline leading down to the fourth intervertebral foramen. Another sinus appeared to the left of the eleventh thoracic spinous process, which was eroded. The tip of the third lumbar spinous process lay bare in the tissues, its base being deeply eroded.

The cadaver was X-rayed. The films showed cold abscesses of the vertebral column at the cervical, upper thoracic, thoracolumbar and lower lumbar areas, also of the manubrium sterni.

The lowest abscess extended from the second lumbar to the second sacral segment. Its walls were calcified and osteosclerotic changes were conspicuous (Fig. 2). Rather than a smooth fusiform outline the abscess presented in both anteroposterior and lateral views a series of crescentic lamellae bridging the intervertebral discs. The fourth lumbar segment was displaced backward and to the left on the



Fig. 11 Thoracic vertebrae 1-8 inclusive No 1084 male negro 24 years of age Ventral and left lateral views Note progress of disease to neural arch with actual loss of spinous process third thoracic

attached to the transverse midlines of the vertebrae dividing the cavities into pockets each of which included a disc and adjacent halves of two vertebral bodies. Where the abscesses were largest in diameter the septa had been torn from the bone centrally but were intact laterally. Toward the ends of the abscesses the septa extended across the bodies. The larger of the pockets formed by the septa extended laterally to the intervertebral foramina in some segments exposing the heads of the ribs and blind sinus tracts reached into the muscle layers of the back by way of the loose areolar tissue about the foramina.

The macerated bodies of the involved vertebrae were eroded superficially on their anterior surfaces. Near the middle of the abscess area the erosion extended backward to the pedicles articular and transverse processes. There was no evidence of bone production and no crushing of the bodies (Figs 11-12).

The fourth distinct tuberculous spinal lesion of cadaver No 1084 was of the cervical area (Fig 13). It involved the first second third and fourth seg-

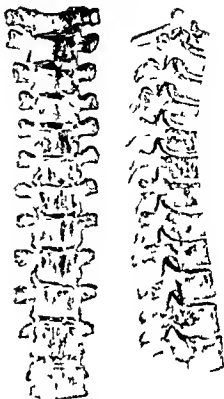


Fig. 12 Thoracic vertebrae No 1116 male negro 31 years of age Ventral and right lateral aspects Less extension of disease to neural arch than in No 1084

ments. No pus was found though a blind sinus tract extended backward to the left of the fourth spinous process. The left articular processes of the second and third showed erosion and tipping as did the body of the third. This body was roughened and somewhat crushed on the left its left lamina and transverse process eroded the destructive changes extending to the spinal canal. Here again were hypertrophic changes occurring with involvement of the articular elements.

Localization of a tuberculous lesion is of course a matter of blood and lymph supply and is therefore related to age and bone structure. Hence the comparative infrequency of cortical bone involvement. The vertebral processes are however not immune to infection. Extension of the process from the primary focus is a matter of force and resistance physiological as well as mechanical. Since fibrous tissue resists destructive changes but gives way slowly under pressure a tuberculous lesion may reach any part of a verte-

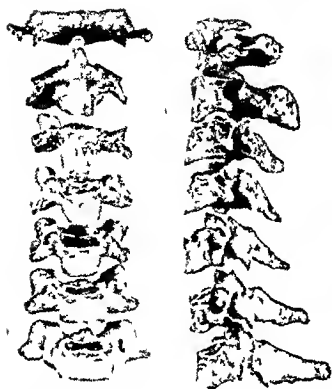


Fig 13 Cervical vertebrae No 1084 male negro 24 years of age Extension of disease to neural arch as in thoracic region

bra before finding egress from beneath the fibroligamentous covering of the bone

According to statistics quoted by Whitman (11), 5.6 per cent of children and 13 per cent of adults under treatment for spinal tuberculosis, and a higher but unknown percentage of neglected cases, develop paralysis. Abscess formation complicates a large number of tuberculous spines. Referring again to Whitman (12) we find that abscess was a complication in 19.7 per cent (Townsend), 22 per cent (Dollinger), and 25.3 per cent (Ketch) of the cases, then this paragraph "It may be assumed that a limited collection of tuberculous fluid is present at some time during the course of Pott's disease in the great majority of cases, an assumption usually confirmed by X-ray examination, but unless it appears as a palpable tumor above or below the thorax or upon the surface of the body its appearance is not often detected." Whitman mentions a series of autopsies in which abscess was found in 80 per cent.

Dissection of these abscesses led to a closer study of the fascia and ligaments about the



Fig 14 Thoracicolumbar region No 11/8 male white 73 years of age Left lateral aspect Healed tuberculous lesion involving twelfth thoracic and first lumbar vertebrae Small caseous abscess not visible

spinal column since little information relative to the subject was found in the textbooks at hand. Hepburn (6) states that the toughest fibers of the anterior spinal ligament are attached to the discs and adjacent bone, none of the fibers being attached to the transverse depression on the front of the vertebral body. We found, however, that the ligament strips easily from the discs and, together with the periosteum with which its fibers are too intimately interwoven for separation, clings most tightly to the bone at this same transverse depression.

Laterally the anterior spinal ligament is outlined by strong fibers reaching from the base of one transverse element to the next, over the intervertebral disc and foramen. Its attachments are related to and reinforced by the fascicles of the stellate and costovertebral ligaments. Covering the anterior spinal ligament is a fascial sheath that splits easily into two layers between which the vessels are carried. The deeper layer is attached along the costovertebral ligaments, the more superficial layer extends outward over the inner surface of the thoracic wall on either side of the

vertebral column. The mediastinal structures and parietal pleura are directly related to this fascia. There is thus a strong fibrous barrier between a pathological process arising in the vertebrae and the mediastinal and pleural cavities. Abscess burrowing along the bone surface crosses the discs to adjacent vertebrae and laterally may eventually reach the loose fatty tissue about the foramina. It may then extend into the spinal canal or into the muscle layers of the back. In the lumbar region the anterior spinal ligament is deficient laterally and the fascia extends over the psoas muscle. Abscess here finds ready egress into the substance of the psoas or lumbar muscles.

In multiple tuberculous spinal foci Pea body (8) found the lesser lesions at lower levels than the primary. If one may judge the relative duration of the four lesions found in Cadaver 1084 the lesions increased in severity from below upward. More careful consideration moreover shows that in the lumbar and thoracicolumbar foci are osteosclerosis calcification of the fibrous structures and in the lower lesion disintegration of the discs. These are signs of duration not present in the higher lesions.

A still later stage in the life history of a tuberculous vertebral focus was shown in Cadaver 1178 a male white 73 years of age (Fig. 14). This was a healed lesion with fusion of two vertebral bodies, complete disorganization of the intervening disc, posterior angulation and osteophytic growth. A small residual abscess was present.

X-ray of the thoracic abscess of No. 1084 shows general cloudiness or lack of tissue contrast, osteoporosis, superficial erosion of the bodies and no angulation. Though these are characteristics of the earlier lesion, we find the cortical processes of the vertebrae involved. In the cervical lesion was no demonstrable fluid, but the articular processes were involved and slipping was under way.

SUMMARY

Detailed study of this series of four tuberculous vertebral columns brings emphasis upon the following characters:

1. The possibility of multiple lesions with consequent necessity of a thorough X-ray examination.

2. The evidence of productive changes in the bone in active tuberculosis as in old healed specimens.

3. The frequency of involvement of articular and muscular processes in addition to the bodies.

4. The absence of angulation or other deformity even in extensive lesions.

5. The coexistence of extensive lesions with merely superficial erosion of the bone.

6. The frequency of abscess formation and the subdivision of the abscess into successive pockets effectually shut off from the thoracic and abdominal cavities but open dorsally between the transverse processes and ribs. There is clinically a fixation of the abscess walls to the middle of the vertebral bodies and not to the intervertebral discs as would be suggested by the anatomical descriptions of the anterior common ligament.

In conclusion I desire to acknowledge my indebtedness to Miss W. M. Kuenzel who has made the photographic and radiographic studies for this investigation, also to Dr. Wingate Todd for the opportunity to make so complete a study of the cases.

BIBLIOGRAPHY

1. BAETJER and WATERS. Injuries and Diseases of the Bones and Joints. New York: Paul B. Hoeber, 1921, p. 299.
2. CAMPBELL W. C. Localized osteospondylitis. *J. Am. M. Ass.* 1910 LVIII 572.
3. COFIELD R. B. Hypertrophic bone changes in tuberculous spondylitis. *J. Bone & Joint Surg.* 1922 IV 337-341.
4. Idem. Bony bridging in tuberculosis of the spine. *J. Am. M. Ass.* 1922 LVIII 1391-1393.
5. FRASER J. I. Tuberculosis of the Bones and Joints in Children. New York: McMillan Co., 1914, p. 114.
6. HERPURN DAVID. Textbook of Anatomy, 2d ed. New York: Wm. Wood and Company, 1903, p. 263.
7. JONES and LOVETT. Orthopedic Surgery. New York: Wm. Wood and Company, 1923, p. 202.
8. PEABODY C. W. Secondary foci of tuberculosis of the spine in Pott's disease. *Ann. Surg.* 1922 LXXV 95-104.
9. IOTT PERCIVAL. The Surgical Works of J. Johnson. London, 1790.
10. WHITMAN ROYAL. Orthopedic Surgery, 5th ed. New York and Philadelphia: Lea and Febiger, 1917, p. 18.
11. *Ibid.*, p. 106.
12. *Ibid.*, pp. 98-99.

THE ANATOMICAL BASIS FOR THE STUDY OF SPLANCHNOPTOSIS¹

By AGNES C VIETOR M.D., F.A.C.S., BOSTON, MASSACHUSETTS

From the laboratory of the New York Lying In Hospital

THESIS

THE fundamental cause of splanchnoptosis is abdominal incompetence, which is a developmental factor. Failures in the normal development of abdominal competence and visceral retention are correlated with the development of certain departures from the normal body form, the most constant of these departures being the retracted lower thorax.

The evolution of the human type is not completed at birth, it has not attained stability as to the position and retention of the viscera, and as to the influence of visceral position and retention, as well as of other evolutionary factors, upon the body form. Hence, variations in these developmental processes ("normal," or retarded, or uncompleted, or reversible) may be observed in continual operation in all human beings, and the pictorial and plastic history of the race shows them to have been occurring ever since such history began. The laws which are shown by this study to be constantly at work modifying visceral position and mobility (as well as body form), appear to be the same in all the children studied, and not fundamentally different in either sex.²

Seeking to average the many individual variations so as to find an anatomical mean which shall serve as a workable basis for the introduction and interpretation of experiments which demonstrate anatomically the above conclusions drawn from clinical observations, the writer presents a study of certain details of the later prenatal evolution of the abdominal viscera, with special reference to the status at term.

This research is an attempt to note and record the mean anatomical conditions with

which the child begins its separate, individual life, before being subjected to postnatal factors, and then to demonstrate experimentally the production of the individual ptoses and the correlated changes in body form.

SUMMARY

The liver. Individual variations in the location of the lower borders of the liver are found at all ages from at least the fourth month onward. The locations found predominating at term are also found in early fetal ages, and locations found predominating in early fetal ages are also found persisting at term.

The sigmoid colon. The sigmoid colon is not the anarchic member of the body which it has been considered. It develops in three definite types according as its length permits the formation of 1, 2, or 3 inverted-U loops. Its varied locations may be classified along four definite lines, and they are the result of migrations and displacements of these loops along well marked paths. By the study of the laws shown at work, all individual displacements of these loops may be retraced, the original type disclosed, and the case so classified. The loops have no secondary fixed bases. As a result of this latter condition and of its constant parietal attachment in the left pelvic or suprapelvic abdomen, the sigmoid colon can always be reached surgically in the left lower quadrant, no matter what its location or type. Distention of the sigmoid colon seems to be a normal phenomenon at term, it may lead to dilatation, or it may lead to damming back of its contents into other portions of the intestines, with distention or dilatation of these latter portions. Anatomical bases for the development of mechanical obstruction and stasis, as well as methods of compensation for these processes, are demonstrated, also initial anatomical paths leading toward the development of torsion of loops.

The proximal colon. The line of the final prenatal disposition of the colon around the

¹ There are 21 children in this group: 21 at term, 20 between the fourth and eighth months of fetal life. Of the 21 at term, 23 are boys, 7 girls, and in 2 the sex was not noted. Of the 20 fetal cases, 9 are boys, 8 girls, and in 3 the sex was not noted. The class number indicates the age of the child. Thus, class 9 means at term, class 8, the eighth month of intra uterine life, and so on. Class 0 means a child who was born at term and lived for an appreciable number of hours but not over twenty-four.

² Read before the Women's Medical Society of New York State, Syracuse, New York, May 11, 1925, and demonstrated on the cadaver at the Clinical Congress of the American College of Surgeons, Boston, October 24-26, 1922 (McDowell Hospital), and New York, October 21-24, 1924 (New York Infirmary for Women and Children).



Fig 1 Photographs of some examples of the positions of the viscera found when the abdomen was opened at term

periphery of the posterior abdominal wall is varied by a greater or less amount of basic redundancy with loop formation in the pelvic sigmoid colon and the subgastric transverse colon. In a certain number of individuals a variable amount of redundancy with loop formation occurs also in other portions of the colon. In the ascending colon this variable redundancy is related to the descent of the cæcum so that two types of undescended cæcum are noted. No definite correlation is discerned between the variable individual redundancy of the proximal colon and the variable individual redundancy seen in the three types of sigmoid colon.

The redundant loops of the proximal colon are practically all fixed yet within their limits of fixation they undergo definite movements of migration and displacement. But they retain their individuality, hence they may be sought in definite parts of the abdomen and their composition and relations identified.

The colon as a whole. Five anatomical points favoring the development of mechanical obstruction and stasis are found in all cases.

These are in the neighborhood of the left psoas at the brim of the pelvis the proximal (subgastric) side of the splenic flexure the subanal or subpyloric area of the transverse colon the proximal (ascending) side of the hepatic flexure, and the cæcum. To these five points may be added one inconstant point which may be developed in any case i.e. the lumbosacral area of the sigmoid colon the area of stasis being found most often to the right of the median line but occasionally to the left. One other inconstant point may exist or may be developed in some cases (this is especially true when the stomach is empty) i.e. secondary subgastric angulation immediately to the right of the splenic flexure.

In more than the majority of cases one finds from one to several added points, in the order of numerical occurrence these are somewhere along the course of the subcosto duodenopyloric transverse colon, the descending colon, the ascending colon and the subhepatic transverse colon respectively, combinations of these added points are frequently found in the same individual. Spontaneous compensation

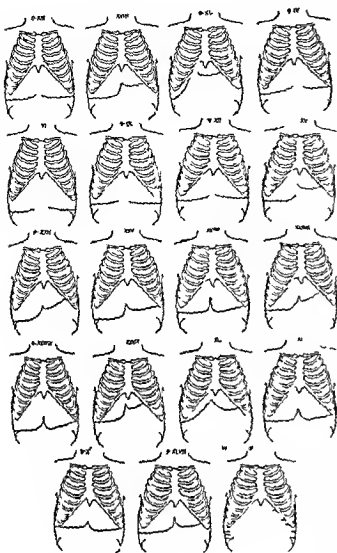


Fig 2 Schematic diagrams of the location of the lower borders of the right and left lobes (and of the median fissure in some cases) of the liver at term

(a) Summary of 18 cases at term—R=right lobe—a neighborhood level apex 12th rib δ midway between apex of 12th rib and crest of the ilium c, crest of the ilium L=left lobe—a under junction 7th rib with its cartilage δ under 8th c 9th, δ 10th e, neighborhood of level of apex of 12th rib f, 10 mm above crest of left ilium M=median fissure—a, one fourth of the distance downward from the gladiolus to the umbilicus δ one third, c one half δ two thirds

for mechanical obstruction and stasis occurs as the result of interchangeability in the form of gathering or falling up of loops

Distention, moving toward or reaching the point of dilatation, is noted in the pelvic sigmoid colon, the descending colon, and the subgastric, the subcystico duodeno pyloric and the subhepatic transverse colons (also in the terminal ileum, in the jejunum, and in the first and second portions of the duodenum)

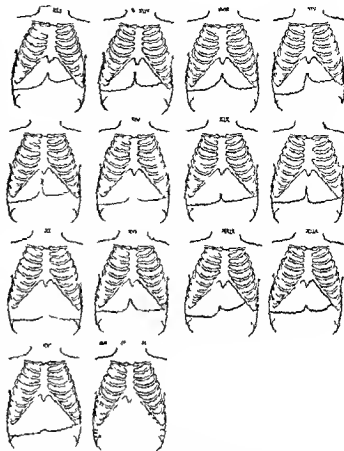


Fig 3 Schematic diagrams of the location of the lower borders of the right and left lobes and of the median fissure of the liver in fetal cases (The class number indicates the fetal age)

(a) Summary of 13 fetal cases between the 4th and 8th months—P=right lobe—a b c as in Fig 2 L=left lobe—b c d e f, as in Figure 2 M=median fissure—c, d as in Figure 2 e just above the umbilicus

The stomach The body of the prenatal stomach which is found empty shows two variations in shape, 1 e, quadrangular and pyriform. Its long axis is directed downward and to the left, though it may approach the vertical, and it tends to unite at an acute angle with the antrum, which latter is usually directed upward and to the right

In the stomach which is found distended, both body and antrum tend to change in shape and position. While the fundus remains domed up under the left lobe of the liver and the vault of the diaphragm, the stomach enlarges (balloons) in all directions, and it tends at first to rotate upward and forward, and later also to swing downward, forward, and to the right, the direction of the antrum tending toward becoming more and more anteroposterior. The pyloric end of the

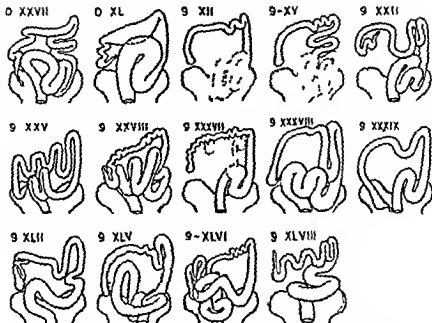


Fig. 4 Schematic diagrams of the colon as found in 14 cases at term. No attempt is made to indicate the large calibre of the sigmoid or other portions except in O-XL.

antrum may or may not move when it does it carries with it more or less of the movable first portion of the duodenum. Sometimes more or less obstruction of the stomach and kinking or torsion of the first portion of the duodenum develop. Four stages of distention of the stomach may be discerned. When the contents are evacuated, the stomach retracts and returns spontaneously to the shape and position of one never distended.

The kidneys. The lower poles of the prenatal kidneys show a varying ascent from below the crest of the ilium, so that at term they are at or above the crest. They also show a more marked tendency to be at the same level at term than in the fetal group.

The uterus. The uterus at term shows a varying ascent of the fundus above the symphysis. It shows lateral and forward rotations, the latter sometimes to such an extent as to develop a sharp ante flexion. It was never found in any direct backward position of either version or flexion.

DETAILS

The prenatal liver (Figs. 2 and 3). Individual variations in the location of the lower borders of both lobes of the liver and in the distance

below the gladiolus of the median fissure, are found at all ages from at least the fourth month onward. The locations found predominating at term are also found in early fetal ages and locations predominating in early fetal ages are found persisting at term.

The colon as a whole (Figs. 4 and 5). The colon may be considered as consisting of the sigmoid colon and the colon which is proximal to the sigmoid. The proximal colon includes the classic divisions of the descending, the transverse and the ascending colons, the transverse colon being in this study subdivided into the subgastric, the subcosto-duodenopyloric and the subhepatic transverse portions, making six portions in all.

Viewing the colon as a whole one is struck with the final prenatal disposition of its parietal attachment around the periphery of the posterior abdominal wall below the stomach and spleen, and below most of the liver and pancreas (Fig. 8), a far progression from original location in median sagittal plane. Traces of this progression are noted in some of the details of this advanced arrangement which epitomizes the procession gradually emerging throughout the animal series.

A similar outline of the visceral attach-

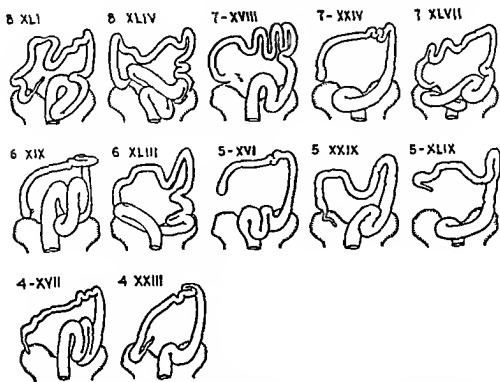


Fig 5 Schematic diagrams of the colon as found in 12 fetal cases between the fourth and eighth months (The class number indicates the fetal age)

ment of the colon mesos with the colon connected, shows a visceral tracing which is a departure from the preceding parietal tracing in the areas belonging to the pelvic sigmoid and the subgastric transverse portions, these two divisions of the colon being found more or less redundant¹ in all the prenatal cases. Though it must be remembered that all, or a part, of this redundancy may, for the moment, be more or less filled up along a line approaching the foregoing parietal attachment. The redundancy in these two areas thus constitutes a basic redundancy of the colon (Fig 9). This redundancy was found unmodified in 4 out of 14 cases at term and in 4 out of 12 fetal cases.

At times an added amount of redundancy, with loop formation, occurs in certain portions of the colon other than the subgastric and the sigmoid colons, thus constituting what may be called a variable redundancy of the colon (Fig 10). More or less of this redundancy was found in 10 out of 14 cases at term and in 8 out of 12 fetal cases.

¹ When the length of any portion of the intestine is greater than the length of its attachment to the posterior abdominal wall or to another viscus (as the attachment of the transverse colon to the stomach by means of the gastrosplenic ligament) this portion of the intestine is called redundant.

The marked variations which are found in the arrangement of the sigmoid colon have caused contradictory conclusions and have led to confusion as to the location of this portion of the colon. The observations presented seem to harmonize the contradictions and to reduce the confusion to order.

The most striking characteristics of the prenatal sigmoid colon are its large calibre, its distention with meconium, its extension over the abdomen in redundant loops, and its practical absence of sacculations.

In all prenatal cases, the sigmoid colon is located along 4 definite lines (Figs 4, 5, 11).

a The left iliac fossa, hypogastrium (behind the bladder), and ascending more or less in the left pelvic or suprapelvic abdomen. 0-XL, 9-XLII, 9-XXVII, 9-XLIX, 8-XLI, 7-XVIII, 6-XIV, 6-XIX, 5-XXIX, 4-XVII, 4-XXIII.

b The left iliac fossa, hypogastrium, and ascending in the left, and thence to the right abdomen. 0-XXVII, 9-XIV, 9-XVIII, 9-LXXVIII, 9-XLI, 9-XVI, 8-XLIV, 7-XLVII, 5-XVI.

c The left iliac fossa, hypogastrium, and more or less in the right lower quadrant, without ascending in the abdomen. 9-IX, 9-XLVIII, 7-XIV, 5-XLI.

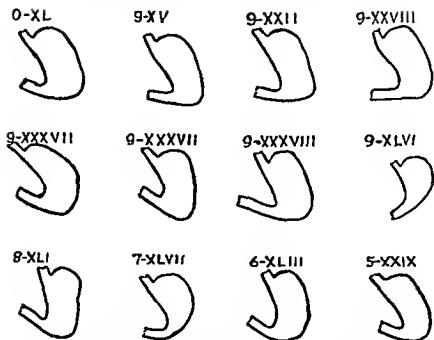


Fig 6 Schematic diagrams of stomachs as found empty (0-XL appears empty but on section its walls were found separated but not apparently convex and it was found to contain meconium 9-XXXVII left is empty as found 9-XXXVII right is the empty shape and position to which the stomach returned spontaneously after deflation (from the distended shape and position in Figure 7)

d The left iliac fossa hypogastrium and ascending into the right suprapelvic abdomen impinging more or less on the right iliac fossa 9-XLV, 6-XLIII

These lines of location may be represented graphically but only one of the four (a) is primary, the other three being derivatives of this through increased redundancy or displacement or both (Fig 11)

As one studies the loops of the sigmoid colon one notes the individual variations which exist at all prenatal ages from at least the fourth month onward to term and which tend to the evolution of three types of sigmoid colon (Figs 4, 5 and 11) according as 1, 2, or 3 inverted U loops tend to project themselves upward into the left abdomen, left and median abdomen or left median and right abdomen

The inverted U form of the loops is determined primarily by the parietal attachment of the pelvic sigmoid meso, thus line of attachment making an inverted U (or V) with an oblique external limb, a vertical median limb, and an apex directed upward

The abdominal inverted U loops may become more or less displaced so that the type is obscured but these displacements follow definite paths and by returning displaced loops along the reverse of these paths the original type may be disclosed and the case so classified

SURGICAL LANDMARKS

The surgical landmarks for identifying and tracing the sigmoid colon (Figs 4, 5 and 11 and 12) no matter what its location or type, take their value from the existence of two factors (a) the practically constant locations of its beginning and termination, and (b) the absence of secondary fixed bases, all the loops being interchangeable and capable of conversion into the one which consists of the whole pelvic sigmoid colon (Fig 12c)

Making an incision in the left lower quadrant of the abdomen, and taking the left psoas muscle at the brim of the pelvis for the first landmark (the external iliac artery here running along the inner border of this muscle) and the iliac sigmoid colon in the left iliac

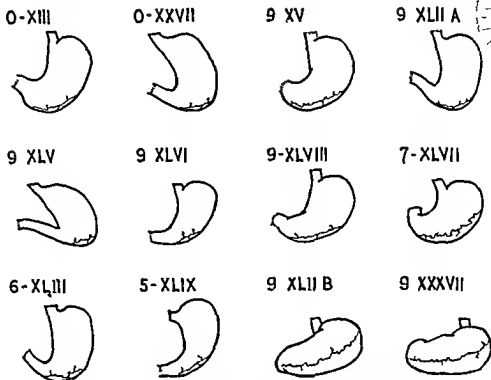


Fig. 7 Schematic diagrams of stomachs as found in varying stage of distention. 9 XLII B and 9 XXXVII were distended experimentally but similar stages were found in other cases. 0-XL in Figure 6 illustrates the first stage of distention i. e. no change from the empty shape and position except separation of the walls by semi solid contents (meconium)

fossa for the second landmark, the angle of junction between the fixed iliac sigmoid and the movable pelvic sigmoid is readily found at the first landmark, this angle opening upward. From this point, the whole pelvic sigmoid colon, whether it be of the first, second or third types, may be drawn through the fingers and traced from left to right.

From an incision made elsewhere, as in the right lower quadrant or the median line, the length of the sigmoid colon may be examined more advantageously by identifying the sacral promontory as the first landmark and after passing upward from the fixed rectum, drawing the tube through the fingers from right to left.

MIGRATIONS AND DISPLACEMENTS OF THE SIGMOID AND PROXIMAL COLONS

Migrations and displacements of the sigmoid colon loops are constantly occurring, and along similar paths, throughout prenatal life from at least the fourth month to term (Figs 4, 5, and 11). They occur by virtue of the rotation of the loops upon a series of

axes, anteroposterior, longitudinal, transverse, oblique, movements occurring on these axes either singly or in combination. Minor displacements also occur as the result of interchangeability and sliding.

The basal primitive position of the primary sigmoid colon inverted U loop is vertical, this loop showing no rotation (4 XVIII). As the sigmoid colon increases in size (from age and other factors), the larger abdominal inverted-U loop tends to leave the vertical position and to rotate to the left or to the right, soon adding a downward movement, the left oblique position suggesting itself as a primary resting position for at least the primary, or first, loop.

The intrinsic migrations of the proximal colon are activities by which the redundant portions occupy more or less of one of two main positions, i. e. (1) they are more or less gathered or pulled up along the lines of their parietal attachments, the loops being thus more or less potential, or (2) their major peritoneal attachments (mesos and gastrocolic and duodenocolic ligaments) are wholly or partly unfolded and the related portions

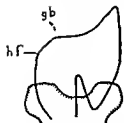


Fig 8 Schematic outline of the final parietal attachment of the colon *gb* gall bladder *hf* hepatic flexure

extend in U loops downward or inward as well as forward in the abdomen (9 xxxvii shows both positions 1 e, before and after distention) In addition to the above intrinsic changes of position the U loops show to a certain degree some of the migrations and displacements already studied in the sigmoid loops 1 e, interchangeability, sliding, and rotations

DEVELOPMENTALLY FIXED LOOPS OF THE PROXIMAL COLON

As already stated no secondary fixed loops are found in the sigmoid colon all the loops being interchangeable and capable of conversion into the one which consists of the whole pelvic sigmoid colon

In the proximal colon, individuality of the fixed loops seems to be a prominent feature This is due to the tendency of the different portions of the colon to become fixed, at least at their beginnings and terminations, owing to decrease in meso depth, with or without other factors (Figs 4 5, Table I)

The points at sectional fixation of the colon are (1) the neighborhood of the third sacral vertebra (2) the left psoas muscle at the brim of the pelvis (3) the crest of the left ilium, (4) the splenic flexure, (5) the neighborhood of the midantrum of the stomach, (6) below the gall bladder, (7) the hepatic flexure, (8) the caudad end of the ascending meso and the ileal end of the mesentery

With remembrance of these points, identification of fixed loops should not be difficult, since with two exceptions the loops are formed between, and not at the points of fixation The two exceptions are (5) the neighborhood

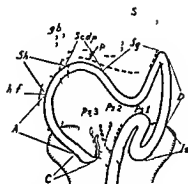


Fig 9 Outline of basic redundancy of the colon more or less redundancy of the pelvic sigmoid and the subgastric transverse colons (found in 4 out of 14 cases at term and in 4 out of 12 fetal cases)—*P* 1 2 3 pelvic sigmoid colon of the first second and third types *i* 1 iliac sigmoid colon *D* descending colon *S* 1 subgastric transverse colon *S* 2 *c d p* subcystico-duodeno-pyloric transverse colon *S* 3 *h* subhepatic transverse colon *i* ascending colon *C* caecum *S* stomach *p* pylorus *gb* gall bladder *hf* hepatic flexure

of the midantrum and (6) below the gall bladder

Within their limits of fixation, the loops of the proximal colon undergo the definite movements of migration and displacement already described But they retain their individuality, hence they may be sought in definite parts of the abdomen and their composition and relations identified

SPONTANEOUS DEVELOPMENT OF ANGULATION, KINKING AND TORSION OF THE COLON, SPONTANEOUS COMPENSATION, ANATOMICAL POINTS FAVORING MECHANICAL OBSTRUCTION AND STASIS

The inverted U positions of the pelvic sigmoid colon—left oblique vertical, right oblique—and the migratory powers of these loops, together with their power of interchangeability are admirably adapted to the reduction to a minimum of mechanical obstruction to the passage of its contents onward toward the rectum And a similar adaptation occurs in the fulling up and inter

²In 9 of the 6 cases (3 at term 6 fetal cases) the fixed loop has its right limb attached to the right, if the midantrum a 1 th the loop hangs meso 1 s below the latter point xxxvii o-xl o x v—th mid a l p 8 xliii y xlviii—th mid a loop y xlviii—the right l o; 6 xliii s xliii s xliii In 3 of the 36 cases (at term 3 fetal cases) the fixed loop has a b i w th g l i bladder o xxxv—the right loop, o xliii y xl i 1 th last case it hangs also meso o les below the 1 p o t of the duod m

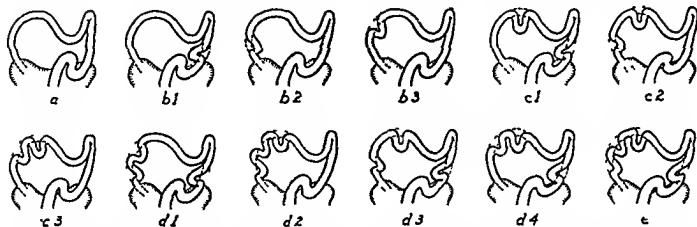


Fig 10 Schematic outline of variable redundancy of the colon according to the portions of the colon affected and according to the number of portions*—(a) Basic redundancy, portions (b1) (b2) (b3) redundancy in 3 portions (c1) (c2) (c3) in 4 portions (d1), (d2) (d3), (d4), in 5 portions, (e), in all 6 portions

(a) 4 out of 14 cases at term—9 xix 9 xxviii 9 xiv 9 xlv 4 out of 12 fetal cases—7 xxiv 6 xiv 5 xiv 4 xxiii
(b) This variation occurs in 2 cases at term and in 1 fetal case. The 3rd added portion is in the descending colon in 9 xiv in the ascending colon in 9 xxiii and in the subhepatic transverse colon in 4 xvi



Fig 11 Diagrammatic representation of the four lines of sigmoid colon location found in prenatal life—(a) left iliac fossa hypogastrium (behind the bladder) and ascending more or less in the left pelvic or suprapelvic abdomen (b) left iliac fossa, hypogastrium and ascend

changeability powers of the loops of the proximal colon (Figs 4, 5, 10, 11, 12c)

Mechanical obstruction and a tendency to stasis develop whenever these processes are interfered with so that angulation and kinking develop

The tendency to mechanical obstruction must always be present, and stasis is always potential, at the bases of one or both limbs of unfolded fixed U loops, since this unfolding moves toward producing or increasing angulation

Irregular diminution in depth of the mesos (or other related peritoneal folds) of a redundant intestine helps to form the angulations and it also fixes them. The fixation diminishes the power of interchangeability, and our studies of the sigmoid colon have shown how

(c) This variation occurs in 4 cases at term and in 4 fetal cases. The 3rd added portion in all these 8 cases is the subcosto-duodeno pyloric transverse colon. The fourth added portion is in the descending colon in 4 cases (9 xxviii 7 xxviii 7 xlvii 5 xlix) in the ascending colon in 2 cases (9 xl 9 xlvii) and in the subhepatic transverse colon in 2 cases (9 xxv 5 xxvii)

(d) This variation occurs in 2 cases at term and in 3 fetal cases. The 3 added portions are the subhepatic transverse, the ascending, and the descending in 2 of the cases (9 xlii 8 xli) the subcosto duodeno pyloric transverse, the subhepatic transverse and the ascending in 1 case (9 xxxvii) the subcosto-duodeno pyloric transverse, the ascending and the descending in 1 case (8 xlvii) and the subcosto duodeno pyloric transverse, the subhepatic transverse and the descending in 1 case (6 xliii)

(e) This variation occurs in 2 cases at term 9 xxviii 9 xxviii

ing in the left and thence to the right abdomen (c) left iliac fossa hypogastrium and more or less in the right lower quadrant without ascending in the abdomen (d) left iliac fossa hypogastrium and ascends into right suprapelvic abdomen impinging more or less on right iliac fossa

this latter form of activity is able to modify, or move, or even to remove, angulation. Similar results are seen in the more proximal colon as the result of the form of interchangeability called gathering or fulling-up of the loops. Hence, the gathering or fulling up of the loops results in a form of spontaneous compensation which reduces or removes the angulations and the consequent obstruction and stasis

The same condition of fixed angulation and unfolding of loops must also cause mechanical obstruction to the movement of antiperistalsis, which may involve the angles formed at the bases of one or both of the limbs of loops

When a U loop is fixed at the bases of both limbs, impediment to the advancing faecal current, other things being equal, is mechanically

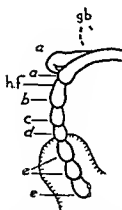


Fig. 13. Descent of the caecum. Levels at which the caecum is found in 26 prenatal cases (r4 at term 1 fetal cases between the fourth and eighth months)—g b, gall bladder h f hepatic flexure (a) 5 XLIX (a) 4 XVII—there is no ascending colon the caecum is continuous with the subhepatic transverse colon (b) 5 XVI the caecum is continuous with a very short ascending colon (c) 9 cases at term 5 fetal cases* (d) 2 cases at term 2 fetal cases (e) 2 cases at term, 2 fetal cases (e') 9-XXXIX at the brim of the pelvis

(c) 9-XXVII 9 XL 9 XII 9 XV 9-XXX 9 XXXVIII 9 XLII 9 XLIII 7 XVII 7 XXIV 6 XIX 6 XLIII 5 XXXIX (d) 9 XLVI 8 XLIV 7 XLVII (e) 9-XXV 9 XLVI 8 XL 4 XXXII

smaller fixed nipples in the course of the colon¹

But angulation, linking, or torsion, however developed, may not be followed by definite obstruction (though it must, mechanically, lead toward stasis) if the compensating power of interchangeability be not impaired—this factor moving toward compensatory displacement of the involved and adjacent parts of the mobile portion of the intestine. Thus, torsion not causing obstruction is shown in 7-XLVII and 6 XIX

DISTENTION (DILATATION) OF THE COLON

Distention of the sigmoid colon with meconium is marked at term (Figs 1, 4, and Table II). When this distention reaches a certain degree, it seems to lead to damming back of the meconium into the proximally continuous portion of the intestine.

Distention, moving toward or reaching the point of dilatation, is noted in the pelvic sigmoid colon and in the subgastric, the subcystico duodeno pyloric, and the subhepatic transverse colons (also in the terminal ileum,

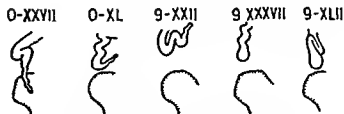


Fig. 14. Adventitious types of undescended caecum

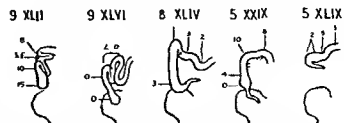


Fig. 15. Illustrating some variations in the adhesion of the mesos on both sides of the hepatic flexure (the figures refer to meso depths expressed in millimeters)

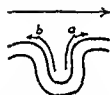


Fig. 16. Other things being equal an unfolded fixed loop tends to offer increased resistance to the advancing fecal current at (a) and to the backward current (antiperistalsis) at (b)

in the jejunum, and in the first and second portions of the duodenum)

TWO TYPES OF UNDESCENDED CAECUM

The ascending colon differs from all other portions of the colon in that one of its ends (the caecum) has at a certain stage of development greater powers of migration or displacement than are possessed by its other end (hepatic flexure), and its migratory end is displaceable upward toward its fixed end, as well as in other directions.

In the presence of such upward migration or displacement (9-XLII) the ascending colon then appears redundant, with the caecum undescended. But if adhesion of the meso be sufficiently delayed to permit the caecum subsequently to migrate or to be displaced downward, sufficient length of ascending colon is seen to exist to change its form to that of non-redundant, with the caecum quite able to reach the iliac fossa.

¹ Such as are found in the proximal subgastric transverse colon in 9 XLIV in the distal subgastric transverse colon in 9 XLVI 8 XLII and 1 XVII in the subhepatic transverse colon in 9-XXXVII, and 4 XVII in the descending colon in 8-XLIV and also in the ascending colon in 9-XXXVII.

TABLE I—INDIVIDUAL OCCURRENCE OF DEVELOPMENTALLY FIRED LOOPS OF THE COLON (EXCLUDING THE SIGMOID COLON)

Case No	Ascending colon	Subhepatic transverse	Subxiphoid non-pyloric transverse			Subxiphoid transverse			Descending colon	Type of pelvic sigmoid	No. of adjacent ports
	Hepatoduodenal junction	Gallbladder	1st duodenum	Pylorus	Mid antrum	Anterior body junction	Body of stomach	Splenic flexure			
Case attention											
o XXVII	—	2 (ho)	—						1	2nd	6
o XL	2	2 (ho)	—						—	1st	4
o XLII	—	—	—						—	nd or 3rd	—
o XLV	—	—	—						2	2 d	3
o XLVII	—	—	—						—	2nd	3
o XLVIII	—	—	—						—	1st	4
o XLXIII	—	— (bl)	—						2	3 d	6
o XLXVII	—	2 (bl)	—						—	1st	3
o XXXVIII	—	—	—						—	2nd	—
o XXXIX	—	—	—						—	1st	2
o XLII	2	2 (ho)	—						1	1st	3
o XLV	—	—	—						—	3 d	2
o XLVI	1	—	—						—	3rd	4
o XLVIII	—	—	—						2	1st	4
Fetuses											
8 XLI	—	—	—						2	1st	3
8 XLIV	1	—	—						2	3 d	3
7 XLVII	—	—	—						2	1st	4
7 XLIX	—	—	—						—	1st	2
7 XLII	—	—	—						1	3 d	4
6 XLV	—	—	—						—	1st	2
6 XLVIII	—	—	—						2	1st	3
5 XLI	—	—	—						—	nd	2
5 XLV	—	—	—						—	1st	4
5 XLIX	—	—	—						1	1st	4
4 XLII	—	— (bl)	—						—	nd	3
4 XLVIII	—	—	—						—	1st	—

It is thus evident that two types of undescended cecum occur (1) a true type of undescended cecum in which the lack of descent is essential it being due to the development of only a length of ascending colon which is insufficient to permit of a lower position of its caudad end the cecum (Fig 13), and (2) an adventitious type of undescended cecum in which the lack of descent is accidental there being already developed a length of ascending colon sufficient to permit of the cecum reaching the crest of the ilium or even a much lower position. But because of

the migration or displacement of some part of this portion of the colon with or without some added irregularity in mesenteric adhesion descent of the cecum is prevented (though perhaps only temporarily) and the more distal ascending colon appears to be redundant and is thrown into one or more loops (Fig 14)

THE STOMACH

The shape and position of the resting or empty stomach are shown in Figure 6. The body of the prenatal stomach which is found empty

TABLE II—DISTENTION OF THE SIGMOID COLON APPARENT DAMMING BACK OF MECONIUM INTO PROXIMAL PORTIONS OF THE INTESTINE, ALSO MARKEDLY DISTENDED

Type	Case Nos					
2nd	o XXVII	Sigmoid	Descending	Subgastric transverse	Ileum	Stomach
1st	o XL	Sigmoid	Descending	All of transverse	Ileum	
2nd or 3rd	o XII	Sigmoid	Descending	Subgastric transverse loop	Ileum	
2nd	o XV	Sigmoid	Descending			
3rd	o XXVIII	Sigmoid	Descending			
1st	o XXXVII	Sigmoid	Lower descending			
2nd	o XXXVIII	Sigmoid	Descending			
1st	o XLVIII	Sigmoid	Descending			
1st	o XLIX	Sigmoid	Descending		Ileum	
Not noted	o LI				Ileum	
nd	o XVII					

In 5 XI the whole colon is about the size of the upper small intestine. a coil of the ileum is dilated and it contains meconium. In 4 XVII the sigmoid colon and the rectum were found empty there were traces of meconium in the caecum and here and there along the colon and coils of ileum were filled with it

shows two variations in shape, i e., quadrangular and pyriform. Its long axis is directed downward and to the left, though it may approach the vertical, and it tends to unite at an acute angle with the antrum, which latter is usually directed upward and to the right.

The shape and position of the distended stomach, the changes in shape and position of the body of the stomach, in shape, position and direction of the antrum, in position of the pylorus and first portion of the duodenum, kinking and obstruction of the stomach and first portion of the duodenum, are seen in Figure 7.

In the stomach which is found distended, both body and antrum tend to change in shape and position. While the fundus remains domed up under the left lobe of the liver and the vault of the diaphragm, the stomach enlarges (balloons) in all directions, and it tends at first to rotate upward and forward, and later also to swing downward, forward, and to the right, the direction of the antrum tending toward becoming more and more antero-posterior.

The pyloric end of the antrum may or may not move. When it does move, it carries with it more or less of the movable first portion of the duodenum. Sometimes more or less obstruction of the stomach and kinking or torsion of the first portion of the duodenum develop.

Four stages of distention of the stomach may be discerned.

1 The first stage of the distended stomach may be considered the one found in o XL, in which only a small amount of semisolid contents had been introduced. In this stage, the stomach retains practically its empty shape and position, the only change being the separation of its walls but this may not be enough to make them appear convex nor to cause any apparent change of position of the stomach as a whole.

2 The second stage of the distended stomach may be considered the one found in o XXVII, o XLIIA, o XLV, o XLIII, o XLIX, and produced experimentally many times. In this stage, the stomach retains more or less its original shape, the anterior and posterior walls are separated and have become convex, the borders and angles have become rounded, walls, borders, and angles begin to become merged into each other, the proximal end of the antrum may or may not begin to be distended. The stomach as a whole has begun to rotate upward and forward, this movement being most apparent at the lower border of the body, at which point the line of vessels along the greater curvature begins to be more or less visible anteriorly. In addition, this forward and upward rotated stomach may or may not have begun to move downward, forward, and to the right, the fundus remaining in place. But this downward, forward, and to the right movement is very slight, its beginning is evident in an increased inclination to the right of the long axis of the body, by a move-

ment of the body antrum junction to the right or perhaps by a slight movement of the pylorus to the right. The long axis of the body may be directed obliquely downward and forward, or downward forward and to the left, or perhaps a little downward forward and to the right. The body antrum junction may be moved more or less to the right. (In none of the cases here noted did it reach the median line.) The pylorus may or may not be moved to the right. (In 3 of the cases here quoted it is noted that the pylorus is moved to the right passing just to the right of the median line.) The antrum is still directed to the right. The relations of the body antrum pylorus and first portion of the duodenum are not markedly changed and all these parts are visible as before.

3 The third stage of the distended stomach may be considered the one found in 6 VII 9 XV 9 XVI 9 XVII and 7 XVIII and produced experimentally in many others. In this stage there is increased rounding of the walls borders and angles and more or less distention of the antrum which at its proximal end becomes more or less merged into the body. The upward and forward rotation of the stomach is increased so that the anterior wall looks more upward as well as forward and the line of vessels of the greater curvature is visible to a greater extent and looks more forward. Perhaps the most evident change is an increased movement of the stomach downward forward and to the right the fundus remaining in place.

The long axis of the body is definitely directed obliquely downward forward and to the right. The body antrum junction is moved to the right in one case as far as 'just beyond the right sternal line'. The pylorus is usually moved to the right, in one case as far as 15 millimeters beyond the right sternal line. The proximal end of the antrum has been displaced so that the antrum is directed backward and to the right some times also upward, sometimes downward. The relations of the body antrum pylorus and first portion of the duodenum are all visibly changed and as this stage advances

the proximal end of the antrum becomes more and more anterior, and the region of the body antrum junction may be moved so far to the right or so far upward as to hide the duodenopyloric region more or less from view.

4 The fourth stage of the distended stomach may be considered the one produced experimentally in 9 XXVII and 9 XLIII and found in many others. In this stage there is a still further increase in the rounding of walls borders and angles with increased distention of the antrum which from its proximal end becomes increasingly merged into the body.

A second upward and forward rotation appears to be now developed so that the stomach as a whole tends to become horizontal and the line of the vessels of the greater curvature looks more directly forward. There is increased movement of the body to the right the fundus still remaining in place. The long axis of the body tends increasingly to approach the horizontal. The body antrum junction is moved farther to the right some times also farther forward and upward. The pylorus may or may not be moved to the right it may also be moved upward. The relations of the body antrum pylorus and first portion of the duodenum are still more visibly changed. The antrum pylorus and first portion of the duodenum tend to be hidden by the distended body. Kinking tends to occur on both the body and duodenal sides of the antrum, sometimes also torsion of the proximal part of the first portion of the duodenum, and varying degrees of obstruction of the stomach and sometimes also of the proximal part of the first portion of the duodenum tend to develop.

No matter what the stage of distention when the contents are evacuated the stomach retracts and returns spontaneously to the shape and position of a stomach which has never been distended (see 9 XXXII).

THE KIDNEYS

The lower poles of the prenatal kidneys show a varying ascent from below the crest of the ilium, so that at term they are at or above the crest, they also show a more

marked tendency to be at the same level at term than in the fetal group ¹

THE UTERUS

The uterus at term shows a varying ascent of the fundus above the symphysis, it is quite movable laterally and forward, the latter sometimes to such an extent as to develop a sharp ante flexion (9-XXVIII), it was never found in any direct backward

position of either version or flexion, but the fundus was not infrequently found in an oblique position, being directed slightly posterolaterally to one or the other side, the anterior cornu (with the appendages) being a little the higher

REFERENCES

¹ In 15 out of 15 cases at term and in 5 out of 13 fetal cases the lower poles of both kidneys are found lying at the crest of the ilium or above this point at distances varying up to 11 millimeters (9 XXVIII) and 7 millimeters (8 VII) in the two groups respectively. In the remaining 8 (fetal) cases the location varies downward to extension below the crest of the lower fourth or fifth of the kidney (4 XVII 4 XXIII). In 5 XVI the left has ascended above the crest while the right is still just below this point. In 10 out of 15 cases at term and in 4 out of 13 fetal cases both lower poles are at the same level. In 5 at term and 7 fetal cases the right lies a few millimeters lower than the left. In 2 fetal cases the right is distinctly higher than the left.

- 1 VIETOR AGNES C. Introduction to the study of the fundamental cause of splanchnoptosis abdominal incompetence a developmental factor Proc xv Internat Med Cong Lisbon April 1905 Section IX Chir pp 79-304 Boston M & S J August 9 and 16 1906
- Idem The fundamental cause of splanchnoptosis—abdominal incompetence a developmental factor A study of certain details of the prenatal evolution of the abdomen with special reference to the status at term Bull Lying In Hosp of New York January 1923 21 139-207 1924 VIII 1-68

SOME FUNDAMENTAL PRINCIPLES IN THE PATHOLOGY OF BONE

BY RENÉ LFRICHE STRASBOURG, FRANCE AND ALBERT POLICARD LYONS FRANCE

THE question of osteogenesis has been discussed for more than 20 years and is still unsettled. In spite of innumerable works the problem seems to be at a stand still without much progress being made. We believe that the reason for this is that it is difficult to reject old notions and to reconstruct our ideas upon a clear ground.

Auguste Comte the philosopher, said "les morts gouvernent les vivants." No where is this tyranny of the past more obvious than it is in the question of osteogenesis. Investigators in this field have tried to compromise with the past to connect new facts and notions with old ones. The result is obscurity and disorder.

We believe that we must work independent of these old notions and build with new materials.

Ten years ago, we began the study of osteogenesis. We approached the subject from the beginning with due respect to the conception that the osteoblast the bone forming cell plays a great part in osteogenesis. We met with obscurities and contradictions. Far from becoming clear as we progressed with our experiments the problem seemed to us to become daily more confusing.

As we examine again each fact gleaned from our work we can account for this confusion. Our starting point is at fault for the classical but false notion of the osteogenic power of the osteoblasts has brought confusion to all the research work on the physiology and pathology of bone, thus making a simple, clear question an extraordinarily obscure one.

In a recent book,¹ we set forth the actual status of the problem of normal and pathological osteogenesis, in accordance with our findings.

We wish to summarize here in an aphoristic form our method of approaching this problem to throw new light on it.

1 The formation of bone is the result of a metaplastic change in the connective fundamental substance. This metaplasia takes place in three stages: (a) transformation of the connective tissue by an edematous infiltration with a multiplication of connective fibrils; (b) infiltration by a special substance, chemically undefined—the precartilaginous substance; (c) deposits in that substance of a calcareous mixture of calcium phosphates and carbonates.

The exact mechanism of each stage is actually unknown but the same successive stages are found in all the crises of normal and pathological osteogenesis which we were able to study.

2 Osseous metaplasia can occur in all types of connective tissue: embryonal type, fibrous type, etc. The numerous forms of osseous tissue as found among man and animals are the result of that process.

3 In osseous metaplasia the cells do not play the part classically attributed to them; that is to say the osteoblasts do not secrete directly osseous substance between the cells. Such a conception is erroneous. The osseous transformation of connective tissue is a phenomenon independent of all cellular action. It is an interstitial and humoral process.

The cells present in the connective tissue make impossible the formation of bone. By the product of their vital activity, they hinder and even can prevent absolutely osseous metaplasia. The connective tissue undergoes an osseous transformation only in the place where there are no cells or only cells with a slow activity.

In the constructed bone, the osseous cells offer a minimum of vitality. They have almost no metabolism. But if their physiological activity is resumed again, there is regression of bone (osteolysis) around them.

For instance in callus tissue when the cells resume their activity, the callus disappears. Osteoblasts are not bone making cells, but on the contrary cells fighting against

¹R. Leriche and A. P. L. ed. Les problèmes de la physiologie normale et pathologique de l'os. Par. Masson et Cie. 1923.

osseous invasion of the connective fundamental substance. They do not produce bone, but hinder its formation.

The classical conception results from an erroneous interpretation of histological pictures with double meaning. The cells play a part contrary to that usually given.

4 The periosteum has no true osteogenic action. In normal conditions, it prevents the formation of bone. It checks osseous infiltration, which spreads widely. All the fasciculated structures, as muscle fibers or connective tissue bundles, do likewise—all prevent any osseous growth perpendicular to their direction. The osseous trabeculae, which, in these conditions, run against muscle or periosteum can on the contrary grow in a parallel direction. They never can go beyond these fibers.

The periosteum does not cover an osteogenic layer with numerous osteoblasts. This conception is a purely theoretical one. It becomes necessary only if an indispensable and fundamental part is given to the osteoblast. But when the periosteum is modified by a change of circulation or by edema, it becomes then a ground for ossification. It is passively ossified—it does not make bone in an active manner.

5 Osseous metaplasia of connective tissue is a reversible process. Bone appears and disappears with the greatest facility. Consequently, it is in a state of unfixed equilibrium.

The facility of disappearance of osseous metaplasia commands all the processes of bone evolution. In all osseous neoformation resorption is simultaneously bound to occur. There is never osseous neoformation without resorption of bone, at least rudimentary. This is an absolute law.

In fractures, the formation of callus is always preceded by a resorption of the broken extremities of bone. In the rarefying diseases of bones, for instance the generalized (Recklinghausen disease) or localized osteitis fibrosa, there is always, in the neighborhood of the rarefied bone, a more or less abundant apparition of new bone.

In bone transplants, the formation of new bone depends on the resorption of the transplant.

It seems that as a result of rarefaction of bone, there is produced a localized oversupply of calcium, which provokes an osseous metaplasia in the surrounding connective tissue.

These "local mutations" of phosphocalcareous materials are very general processes, which explain all heterotopic ossifications. All tissues which are infiltrated with phosphocalcareous salts—calcified cartilage, necrotic and dead tissues with lime infiltration—can, like the bone tissue, undergo resorption. Likewise a local calcareous oversupply is produced which incites in the neighborhood the formation of new bone. In that manner, it is possible to explain the formation of heterotopic ossifications (muscular osteomata, ossifications in blood vessels, nerves, heart, in surgical scars, etc).

6 Bone resorption takes place in two ways by osteolysis or osteoclasia.

In osteolysis, the osseous metaplastic transformation of the fundamental connective substance simply disappears. The connective matrix appears again. Osteolysis is connected with humoral processes, bone vanishes without exhibiting any peculiar histological picture.

In osteoclasia, the action of phagocytic giant cells, the osteoclasts, occurs. These cells are in no manner specific. They are banal phagocytes, proceeding from evolution of osteoblasts.

In the resorption of bone, the part of osteoclasia is far more reduced than that of osteolysis.

The resorption of bone is specially directed by humoral phenomena, dependent on the circulatory activity in the bone. The increase of activity of the circulation involves bone resorption, with a consequent local calcareous oversupply and the formation of new bone in the vicinity.

Many diseases of skeleton, characterized apparently by an osseous neoformation, are really dependent on bone resorption, caused primarily by circulatory disturbance. All is explained by a vasomotor phenomenon. This notion is very important. In pathology, a new and important chapter must be opened, the chapter of bone diseases of vasomotor origin.

AFFECTIONS OF THE COMMON BILE DUCT ASSOCIATED WITH JAUNDICE¹

By DONNIE L. B. COBB, M.D., ROCHESTER, MINNESOTA
Fellow in Surgery, The Mayo Foundation

MUCH has already been written with regard to the problems encountered in the treatment of jaundiced patients. The object of this paper is to consider the subject of obstructive jaundice in a broad sense to deal with the newer ideas bearing on this type and to attempt to evaluate the more recent laboratory tests as applied to the condition. A study was made of the cases of affections of the common bile duct with associated jaundice in which operation was performed at the Mayo Clinic during the year 1924. There were 142 patients who had had operations on the common bile duct 99 of whom were either jaundiced at the time of operation or gave a history of jaundice. Of the 99 patients 5 required a second operation making the total number of operations 104. It is with the latter group that this paper is concerned.

AGE AND SEX

There is nothing particularly unusual in the age incidence of patients with disease of the common duct. In this series the ages varied from 25 to 70 years; one patient had congenital absence of the common duct. The females were usually younger than the males; their average ages being 48 and 53 years respectively. The incidence of females in the group was 20 per cent greater than that of males which is in accord with the recognized predilection of this sex toward cholecystic disease with formation of stone.

JAUNDICE

Jaundice was constant in 34 per cent of the cases, and intermittent in 66 per cent, so the relative constancy of the condition is hardly a determining factor in establishing the diagnosis. It had been present from a few days to 35 years but the average duration was greater in the intermittent type. A certain degree of jaundice was noted at the time of the examination in 57.6 per cent of the pa-

tients. Thirty-eight of the 99 patients had had operations previously for disease of the biliary tract, in all 52 operations had been performed consisting of removal of the gall bladder or drainage of the tract, or both. The time interval since the operation varied from 2 months to 12 years. Only 8 of the 38 patients had had any jaundice before the first operation while 30 had become jaundiced since.

OPERATIVE FINDINGS

Stone in the duct is the most frequent source of trouble in cases of obstructive jaundice. Next in order are the results of previous operations on the biliary system (7), and falling far below either of these are such conditions as malignant disease, pancreatitis, cholangitis, hepatitis and peptic ulcers. When classified as to the operative findings these conditions fall into three divisions: stones, strictures and residual inflammatory processes.

Stones. In 79 cases the presence of stones was regarded as the sole cause of obstruction in the duct. That the degree of obstruction thus produced varies greatly in different persons and in the same person from time to time is shown by the fact that jaundice was constant in only 28 per cent. Previous operations had been performed on the biliary tract in 88 per cent, in some cases the jaundice appeared immediately after operation, in others, 10 years afterward.

The chief factors influencing the formation of stone are thought to be infection and an increase in the cholesterol content of the blood. It is the general belief that most gall stones are formed within the gall bladder, and in most of the cases in which stones are found at the second operation cholecystostomy was the primary operation. There are two ways of accounting for the recurrence of stones after cholecystostomy: after such an operative procedure particles are prone to be left undiscovered in the cystic duct, and these may

¹Abstract of the 57th meeting of the Faculty of the Mayo Clinic, held at the Mayo Clinic, Rochester, Minn., September 1925.

later enlarge and pass into the common duct, and drainage of the gall bladder does not rid its walls of infection. If an effort is to be made to rid the body of its greatest stone-forming center, cholecystectomy is the operation of choice unless there are contra indications. It has been asserted that, after cholecystectomy, the common duct assumes the function of the gall bladder and thus that stone formation is more prone to occur in this structure (8). There is both experimental and clinical evidence of dilatation of the extrahepatic bile passages after the gall bladder has been removed or destroyed by disease. However, the increase in the viscosity and the pigment content of the bile that normally occurs in the gall bladder does not occur in the common duct in patients who have lost the gall bladder. In a study of a large group of cases in which cholecystectomy had been performed more than 20 years previously, it was pointed out that there was evidence of stone in the common duct in only one (6). Thus, although changes in the extrahepatic bile passages do occur following cholecystectomy, they do not result in altered function of such a degree as to produce disturbing symptoms, nor is there experimental or clinical evidence to substantiate the supposition that they will result in the more frequent formation of stone in the common duct. There are instances in which symptoms recur following cholecystectomy and exploration of the common duct, and stones are found in the common duct at the second operation, but it is now generally conceded that most of them were simply overlooked at the time of the primary operation. If a small stone is situated near the ampulla it may be easily overlooked. In the search for stones at operation, care must be taken lest a stone be forced back into one of the hepatic ducts and lost within the liver, later to pass downward and give trouble. All stones found at the second operation should not be charged to oversight or lack of care on the part of the surgeon, for it cannot be definitely known that stones do not form in the biliary ducts. A large number of calculi in the intrahepatic ducts, revealed at postmortem examination, is difficult to explain on any basis other than

reformation. The great length of time between operation and symptoms in many of the cases would also seem to support such a hypothesis, especially if sudden and fulminating symptoms developed after years of quiet.

Stricture The occurrence of stricture of the common duct without disease of the gall bladder or stones in the ducts and not preceded by operations on the biliary tract is extremely rare. A narrowing of the duct may be produced by the encroachment of a malignant growth, by the pressure of adjacent enlarged lymph nodes, or by the close proximity of a localized inflammatory process, but this cannot be considered an actual stricture. True stricture consists of a narrowing of the lumen of the duct produced by a contraction of its walls, resulting from previous operative trauma or from actual disease within the walls. Stricture of the common duct was seen in 20 cases, in 16 of these it was the only finding accountable for the obstruction, and in only 4 cases was interference with the bile flow partly attributable to the concomitant presence of stones. There was a history of jaundice in each of the 20 cases. It would seem natural that stricture of the duct sufficient to cause symptoms would result in constant jaundice. In cases in which the stricture does not produce complete obstruction, the coexistence of a low grade infection with its recrudescence and abeyance at times could result in oedema sufficient to close the lumen completely, and intermittent jaundice would occur. Or, a stone might temporarily occlude the lumen at the stricture and result in a periodic type of jaundice. In 45 per cent of the cases of stricture, the jaundice was intermittent. There was no appreciable difference between the frequency of constant and intermittent jaundice among the cases of uncomplicated stricture and among those associated with stones, so the type of jaundice is not an aid in determining whether the obstruction is due to stricture, stone, or a combination of the two. Injury of the submucosa and its replacement by fibrous tissue is the basis of stricture formation. Prolonged irritation by stone may result in localized injury of the lining epithelium of the duct and involvement of the submucosa by an inflammatory proc-

ess. The destruction of that layer which contains the real strength of the duct wall and its replacement by fibrous tissue would result in the formation of a true stricture. In 19 of the 20 cases of true stricture, operations had been performed on the biliary tract, in the other case stones were present thus affording an example of stricture formation from this source.

The onset of jaundice after the primary operation in the 19 cases occurred from a day or 2 to 8 years afterward. If jaundice appears soon after operation it is easily explained on the basis of an injury which has resulted in almost immediate obstruction. When jaundice does not develop until several months after operation the stricture is probably slowly progressive and only eventually becomes obstructive. It is logical to assume that if the patient has been free from jaundice for several years after operation the stricture is the result of an inflammatory process largely outside the wall of the duct. This condition may have existed at the time of the primary operation. Too many drains or drains left in place too long could easily prove a factor in producing stricture.

Residual inflammatory processes. A markedly diseased gall bladder or one that has been drained may become so bound down by adhesions that it cannot function normally, and its presence will be a menace to the patient. After cholecystostomy more than 50 per cent of patients have a return of symptoms requiring a second operation. It is evident that cholecystectomy is the operation of choice whenever the organ is definitely diseased and it can be removed without too great a hazard. In spite of the fact that few fields of surgery offer as satisfactory results as the biliary tract, probably no other surgical condition is allowed to progress so long before the proper means are undertaken for its cure. The gall bladder and appendix are often infected concomitantly. Prolonged infection may result in a variable degree of damage to the liver or pancreas, or both and in that event removal of the gall bladder would not clear up all of the symptoms immediately, as it does not rid the patient of all of the pathological changes (10). Symptoms of obstruction of the

common duct with or without jaundice, may occur during the immediate postoperative convalescence following either cholecystectomy or the combined operation in which the common duct is opened. Although the possibility of stone or stricture of the duct must be considered the attacks are usually due to the passage of mucus or sloughs of tissue, or to temporary narrowing of the lumen by postoperative inflammation or a hematoma.

However the cases in which symptoms occur several weeks to several years after operation are the ones that deserve special consideration. Judd and Burden (9) have recently reported twenty four such cases, the symptoms developed from a few weeks to 4½ years after the primary operation. No obstruction could be demonstrated at the second operation although the complaints were usually most suggestive of stones in the common duct. Pancreatitis and hepatitis were the chief findings, and most of the patients were relieved by prolonged drainage of the common duct. In the 104 cases in the series there were 5 in which biliary obstruction with jaundice could be accounted for only by the presence of inflammatory conditions, in all there had been previous operations on the biliary tract. The time interval between the primary operation and the appearance of symptoms varied from a few weeks to 3 years. In 2 cases the gall bladder had not been removed and its inflammatory condition was considered the chief cause of present symptoms. In one of these there was also definite hepatitis and pancreatitis. In the remaining 3 cases cholecystectomy had been performed, of these cholangitis proved to be the cause of the present ailment in one, pancreatitis in the second and hepatitis in the third.

BILIRUBIN AND THE VAN DEN BERGH TEST

McNee is credited with having first pointed out that the reticulo endothelial system probably formed the bile pigment. This system, first described and named by Aschoff is composed of the endothelial cells of the liver, spleen, bone marrow, lymph nodes, lymph and blood vessels and serous cavities. It exhibits a definite relationship to the blood forming

organs but is as significant in the destruction as in the formation of blood. Mann has produced jaundice in dogs after complete removal of the liver. In his experiments the bile pigment was formed in the absence of the liver in quantities as large as in the natural daily output. It would seem that in man bilirubin is largely formed in the endothelial cells lining the sinuses of the spleen, those contained in the bone marrow, and the endothelial cells of Kupffer which lie along the venous capillaries of the liver. The formation of bile pigment in the polygonal cells of the liver has never been demonstrated. Only in the further course of toxic formation of bile pigment or with obstruction to the normal flow of bile do changes in these cells occur. The metabolism of bilirubin must be regarded as being anhepatogenic so far as the polygonal cells of the liver are concerned. These act in the capacity of its secretory organ, just as the kidneys are the chief secretors of urea formed elsewhere in the body. Regarding the formation and secretion of bilirubin in this light, jaundice may be classified as (1) hæmolytic, (2) toxic and infective hepatic, and (3) obstructive. The same patient may have more than one form of jaundice.

In hæmolytic jaundice there is an excessive destruction of blood. Bilirubin is formed in excess and the polygonal cells are incapable of secreting it all. It is partly secreted and partly retained in the blood. In toxic and infective hepatic jaundice the rate of formation of bilirubin is normal but the polygonal cells of the liver are inefficient. In cases of obstructive jaundice also, bilirubin is formed in normal amounts. The liver cells are capable of secreting it, but it is blocked in the small bile passages within the liver or in the larger extrahepatic ducts, and the bilirubin after being secreted is reabsorbed.

The test for the detection of bilirubin in the blood was devised by Van den Bergh and bears his name. Its simplicity recommends it for general clinical use. If, after Ehrlich's diazo reagent is added to the blood serum or plasma, a violet tint develops immediately the direct reaction occurs, and if the proteins are precipitated by the addition of alcohol and a definite rose pink color develops in the super-

natant fluid, the indirect reaction occurs. The quantitative measurement of serum bilirubin is made by comparing it with an inorganic standard, the color of which corresponds to the 1:200,000 solution of axobilirubin.

There is a difference of opinion with regard to the significance of the direct and indirect reactions, and as a practical means of distinguishing between the different clinical forms of jaundice, these reactions are of limited value. (1) In cases of frank hæmolytic icterus the indirect reaction obtains, and in cases of definite obstructive jaundice, the direct reaction occurs. In the large group of cases that usually presents the greatest difficulty in diagnosis, in which the jaundice is probably due to partial or complete failure of the liver cells to secrete bilirubin, these laboratory findings are of doubtful value. The reaction may be direct, indirect, or a mixture of the two. It is the quantitative determination of bilirubin that is of especial value in cases of obstructive jaundice.

Although cholæmia is the true condition that follows obstruction to the outflow of bile, there is at present no satisfactory means of determining clinically whether bile constituents other than bilirubin are present. Thus, one is forced to rely on the determination of the degree of bilirubinæmia as the best index to the degree of the cholæmia. It is with this idea in mind that the bilirubin content was studied in this series of cases of obstructive jaundice. Normally, the blood serum contains from 0.5 to 1.0 milligrams of bilirubin for each 100 cubic centimeters. The threshold of elimination of bilirubin is between 1.5 and 2.0 milligrams for each 100 cubic centimeters. At about this point, it is excreted by the kidneys and colors the skin, mucous membranes, and sclera.

The cases were classified according to whether the jaundice was intermittent or constant and according to its degree at the time of the patient's admission, and in each the bilirubin content of the serum was studied. In the cases of intermittent jaundice, there was a wide variation in the serum bilirubin content, ranging from 53.4 to 0.8 milligrams for each 100 cubic centimeters. The length of time that the patient had had this disease bad

no effect on the serum bilirubin content. In the cases of constant jaundice, the bilirubin content varied from 55.0 to 1.7 milligrams for each 100 cubic centimeters and there seemed to be a proportionate increase in the serum bilirubin with the duration of the jaundice. The degree of clinical jaundice was graded on a scale ranging from 1 to 4. As a rule, the more marked the jaundice the greater was the hyperbilirubinemia. Patients jaundiced at the time of operation showed a very marked decrease in the serum bilirubin content after the obstruction had been relieved and adequate drainage established. That the estimations of serum bilirubin are of definite value is without question; the presence of latent icterus can be established by means of them; the degree of frank icterus can be determined with certainty and its progress, both preoperatively and postoperatively, may be accurately followed. The condition of the liver was noted at the time of operation in all of these cases and in neither the intermittent nor the constant form could there be demonstrated an association between the amount of hepatitis present and the duration of the jaundice.

TEST OF HEPATIC FUNCTION

The liver does not lend itself readily to functional study. It receives its blood supply from two entirely different sources, the hepatic artery and the portal vein, and the products of its activity are discharged in different directions, into the blood and into the bile. It is an organ of multiple functions, and our knowledge of its physiology is as yet inadequate.

Numerous tests have been devised to study the efficiency of the liver (5, 14, 15). Probably by no single test will it ever be possible to determine the efficiency of all of its activities. At present the use of phenoltetrachlorophthalein seems to be of most value. This dye after intravenous injection is taken up from the blood stream largely by the liver and secreted in the bile. Solutions of the dye may be obtained in ampules. One cubic centimeter is injected intravenously for each 22 pounds of body weight and at the end of 15 minutes, 1 hour, and 2 hours, samples of the blood are taken.

To the clear serum a few drops of 10 per cent sodium hydroxide is added to bring out the color of the dye, and comparison is made with standard tubes. In this way the amount of dye remaining in the blood stream is determined. In normal persons the dye is rapidly removed from the blood stream, only from 5 to 7 per cent remaining at the end of 15 minutes, and usually less than 3 per cent at the end of 1 hour. In the patients who were jaundiced at the time of the examination, there was a constant and definite increase in the dye retention proportionate to the degree of jaundice, thus showing the test to be of value in indicating the degree of obstruction. Patients with a history of constant jaundice had a greater degree of dye retention than those with intermittent jaundice but in neither group was there any parallelism between the degree of retention and the duration of symptoms. No relation between the gross hepatitis as noted at operation and the degree of dye retention could be demonstrated. In the patients who were jaundiced at the time of examination the degree of dye retention and the amount of serum bilirubin present were closely related. Thus the phenoltetrachlorophthalein test gives a fairly accurate index of the degree of retained bile but an obstruction in the duct exerts its influence on the amount of dye retained and makes the test of limited value in estimating the amount of actual damage to the liver. In cases without clinical evidence of jaundice and with only a slight degree of dye retention, the figures for the determinations of serum bilirubin are often well above normal. Therefore, it would seem that in cases of obstructive jaundice a knowledge of the amount of bilirubin in the blood serum gives a more accurate index to the degree of retention and in cases without clinical jaundice it may reveal the presence of latent jaundice whereas the dye retention test would not permit definite conclusions.

TREATMENT WITH CALCIUM

Before an operation on a patient with jaundice or with a history of recent jaundice, the coagulation time of the blood should be determined and if it is abnormally prolonged, methods should be instituted to bring it with

in normal limits. Walters, in a study of obstructive jaundice, found that more than 50 per cent of the postoperative deaths were accompanied by, if not directly due to, intra-abdominal hæmorrhage. In none of these could a definite point of hæmorrhage be demonstrated at postmortem examination, the bleeding having been in the form of generalized oozing from traumatized surfaces.

In investigations of the blood clotting properties in a case of jaundice, not only should the coagulation time be determined, but also the calcium coagulation time, and the two should be compared. Walters found that the intravenous administration of 5 cubic centimeters of a 10 per cent solution of calcium chloride on 3 successive days was without toxic effect and that it was sufficient to produce the desired effect on the coagulation time.

In this series of cases neither the coagulation nor the calcium coagulation time seemed to bear any definite relation to the period of either the intermittent or the constant form of jaundice. In patients who were jaundiced at the time of admission, there was an increase in the coagulation time proportionate to the degree of jaundice. There also existed some parallelism between the amount of serum bilirubin, as a more accurate index to the degree of retained bile, and the increased coagulation time. In patients with an abnormally long coagulation time, the calcium coagulation proved to be within normal limits. The administration of calcium chloride intravenously resulted in a decrease in the coagulation time of the blood. From this it would seem that the duration of jaundice has little if anything to do with the clotting properties of the blood, but that the degree of jaundice is more of a determining factor.

UREA

The part played by the liver in the nitrogen metabolism of the body has caused wide spread discussion and has resulted in a divergence of opinion. The results obtained from both experimental and clinical investigations have been interpreted variously. Recently, Bollman, Mann, and Magath have shown experimentally that the liver is the most important organ concerned in the formation of

urea, and clinical studies of extensive hepatic disease indicate that the liver has marked influence on the production of urea. The extent of lesions and the functional impairment of the liver may vary greatly, therefore it is difficult to draw conclusions of diagnostic value.

In this group of cases of obstructive jaundice the blood urea ranged from 46 to 9 milligrams for each 100 cubic centimeters. Neither in the cases of intermittent nor in those of constant jaundice was there a parallelism between the blood urea and the duration of jaundice. The cases in which there was jaundice at the time of examination did show a decrease in the blood urea proportionate to the degree of clinical jaundice and proportionate to the degree of dye and bilirubin retention. This decrease, however, was usually not sufficiently below normal to be of diagnostic aid. Although experimental evidence points conclusively to the importance of the liver in the metabolism of urea it is difficult to try to estimate the amount of damage to the liver from the amount of urea contained in the blood in cases of obstructive jaundice.

CONCLUSIONS

- 1 A consideration of the age and sex incidence aids little in the interpretation of obstructive jaundice.

- 2 Stones are the most frequent cause of obstruction of the common duct.

- 3 True stricture of the common duct occurs most often after operations on the biliary tract.

- 4 A diagnosis of stricture of the common duct cannot be established by differentiating between constant and intermittent jaundice.

- 5 Jaundice may result from hepatitis or pancreatitis without any demonstrable evidence of obstruction, at the time of operation.

- 6 Experimental evidence points toward the reticulo endothelial system as being the chief source of bile pigment, and toward the liver as being the secretory organ.

- 7 The Van den Bergh test affords a means of detecting bilirubin in the blood. In obstructive jaundice its chief value is to permit the determination of latent icterus and to afford a means of accurately following the

progress and regress of jaundice, both pre operatively and postoperatively

8 Obstruction to the outflow of bile seems to invalidate the use of the tetrachlorophenolphthalein test as a means of determining hepatic efficiency

9 In cases of obstructive jaundice the results of this test are more or less analogous to those of the van den Bergh test, but it does not give as accurate an index to the degree of retained bile as does the latter

10 Blood urea determinations have proved to be of little value in cases of obstructive jaundice

BIBLIOGRAPHY

- 1 ANDREWES C H A clinical study of van den Bergh test in jaundice *Quart J Med* 1924 xviii 19
- 2 ASCHOFF LUDWIG Lectures on Pathology New York P B Hoeber 1924 363 pp
- 3 BERCH A A H VAN DEN Discussion on jaundice *Brit M J* 1924 ii 498-500
- 4 BOLLMAN J L MANN F C and MACARTH T B Studies on the physiology of the liver VIII Effect of total removal of the liver on the formation of urea *Am J Physiol* 1924 lxix 371-392
- 5 GREENE C H Functional tests in hepatic disease *Minnesota Med* 1925 viii 142-145
- 6 JUDG E S Condition of the common duct after cholecystectomy *J Am M As* 1923 lxxix 704-709
- 7 Idem Problems encountered in the treatment of disease of the biliary tract *Minnesota Med* 1924 viii 162-170
- 8 JUDG E S and BURDEN V G Non-calculous intermittent biliary obstruction following cholecystectomy *Ann Surg* 1924 lxxix 533-537
- 9 Idem Postoperative structure of the common bile duct *Ann Surg* 1924 lxxix 210-216
- 10 JUDG E S and MANN F C The effect of removal of the gall bladder *Surg Gynec & Obst* 1917 xxiv 43-44
- 11 MCNEE J W Discussion on jaundice *Brit M J* 1924 ii 495-498
- 12 MANN F C and MACARTH T B Studies on the physiology of the liver IV The effect of total removal of the liver after pancreatectomy on the blood sugar level *Arch Int Med* 1923 xxi 707-806
- 13 MANN F C BOLLMAN J L and MACARTH T B Studies on the physiology of the liver IX The formation of bile pigment after total removal of the liver *Am J Physiol* 1924 lxxix 393-409
- 14 ROSENTHAL S M An improved method for using phenoltetrachlorophthalein as a liver function test *J Pharmacol & Exper Therap* 1922 xix 385-391
- 15 TOWNFREE L G The rôle of functional tests in the study of diseases of the liver *Med Clin Amer* 1925 viii 1389-1401
- 16 WALTERS WALTMAN Pre-operative preparation of patients with obstructive jaundice *Surg Gynec. & Obst* 1921 xxiii 651-656

PREGNANCY, PARTURITION AND HEALTH AFTER SURGICAL REPLACEMENT OF THE UTERUS—A RETROSPECT

BY CARMELO REYES, M D MANILA, PHILIPPINE ISLANDS
Departments of Surgery and Gynecology University of the Philippines

THIS paper is based upon a systematic follow up of 377 selected gynecological patients who have been operated upon (by various other surgeons and the writer) at the Philippine General Hospital between the years 1909 and 1922 inclusive, so as to allow a reasonably sufficient time for observation, with an average duration of $8\frac{1}{2}$ years since the operation. Incidentally, as far as we are aware, this is the first effort of the kind made locally with any set of patients operated upon.

Somewhat contrary to what the title of the paper would suggest, however, aside from the surgical replacement of the uterus, displacements of which organ were frequently the most obvious anatomical lesions found previous to the actual laparotomies, by far the majority of the patients under consideration had other associated gynecological lesions which were not always so obvious at the time of the examinations but for which they were operated upon. In other words, the replacement of the uterus was only one of several procedures adopted for the purpose of curing or relieving various disorders, chiefly pelvic, but its nature was singled out in the title because it was the one procedure employed in each and every case. The actual number of patients operated upon for displacements of the uterus alone constituted a small proportion—only 16 per cent—much too small to be of value, either statistically or otherwise.

The selection of patients was made not on account of any undue desire to choose only those presenting the most favorable conditions and be able thus to produce the best results, but in order to include none but patients during the childbearing period (between 15 and 45 years of age) who, for obvious reasons, aside from the correction of their uterine displacements presented no other lesions or had no other operations performed upon them which might seriously or permanently jeopardize their chances of bearing

children, such as an occasional, moderately adhesive salpingitis for which salpingostomy was performed, or as was more frequently the case, a slightly more or less cystic condition of the ovaries which called for incision, curettage, and suture, and occasionally again, partial oophorectomy.

The effort to follow up these patients extended for the last 8 months and was successful in 49 per cent of them (173). Excluding 11 who failed to furnish the necessary obstetrical data, it is upon these patients who answered our queries that the subsequent figures noted down in this paper are actually based.

It was evident to the writer that any major operative procedure done upon a patient during the childbearing period (55 per cent of those concerned in this study were between 25 and 30 years of age) which might affect that important function one way or the other, even in cases in which, for sufficiently valid reasons, the same may have appeared to be a secondary consideration at the time of the operation, as was largely true among our patients, must be carefully studied in its effect not only upon childbearing but also upon parturition and health in general, including menstrual function, and we must bear in mind that one does not necessarily follow from the other. It is felt that even if operation has failed as far as childbearing is concerned, its performance must be justified, at least, by a reasonable degree of benefit to the general health of the patients. Hence the scope of this paper.

We have, therefore, taken into consideration the reproductive aspect of the question on the one hand, and its purely vegetative aspect, so to speak, on the other. As to which of them should take precedence is subject, we think, to quite a difference of opinion, depending upon one's own individual social views. The fact is emphasized in this connection that only relatively few patients in our series were operated upon with a view to having children.

Grouped by similarity of conditions and of end results, the patients were divided into four groups, as per Table I

TABLE I—END RESULTS

	Cases	Per cent
I Patients who remained single or widows or who became widows soon after operation	24	15
II Patients who failed to bear children before and after operation	21	13
III Patients who ceased bearing any further children after operation	40	25
IV Patients who continued bearing children (55 71%) or bore them after marriage (14 18%) or only after operation (8 10%)	77	48

Abortions or miscarriages and the occasional stillbirths either before or after operation were classified among failures to bear children when they were not accompanied by other pregnancies coming to full term and are named interchangeably throughout this paper. For the sake of clearness Groups III and IV will henceforth be referred to both in the text and in the tables, as the negative and positive groups or patients respectively.

Except with reference to the study of the effects of the operations upon health Groups I and II were excluded from further consideration. Group I for an obvious reason and Group II because at best there could be only a feeble presumption as to the procreating power of the males concerned in the group there being no data about them other than a history of venereal infection in 23 per cent so that we were not justified in attempting to draw conclusions one way or the other from such one sided premises.

Tables II, III and IV show in what way the surgical replacement of the uterus and minor associated procedures have affected pregnancy, parturition and health respectively.

The tables and figures speak for themselves we believe, and enable us to sum up our findings by saying that the operations the remote effects of which we have undertaken to study do not appear to have affected pregnancy, parturition and health unfavorably to say the least but quite the contrary. In fact, of the patients who reported to have had abnormal parturition after operation, few needed actual medical assistance, with occa-

TABLE II—EFFECT UPON PREGNANCY

	Cases	Per cent
Negative group	40	33
Positive group	77	67

TABLE III—EFFECT UPON PARTURITION

	Cases	Per cent
Positive Group		
Normal parturition before and after operation	27	73
Normal parturition after operation	6	16
Abnormal parturition after operation	2	5
Abnormal parturition before and after operation	2	5

TABLE IV—EFFECT UPON HEALTH

	Cases	Per cent
Excellent or better health after operation	78	66
Same	37	27
Worse	16	12

sional use of forceps, the reported abnormalities consisting in the majority of cases of relatively prolonged or painful (difficult) labors not oftener than are usual among ordinary parturient women. Then a number of those reporting as not doing as well as before the operation related symptoms that could hardly be attributable certainly not directly, to the operations symptoms frequently referable to tuberculosis which we know only too well as being very frequent among our hard worked women operations or no operations. It is interesting to note a common and apparently characteristic complaint among the patients operated upon (16 per cent) namely, abdominal pain or sensation of ill being upon exertion. Curiously enough very few gave definite information about their menstrual function although specific questions were asked about it. It is fair to suppose, however, that the answers about health were meant to cover the condition of that function.

A comparison between the states of health of patients whose childbearing was interrupted and of those whose childbearing either continued or commenced after the operation gives us more interesting figures still. Thus it is quite significant that the number of patients doing excellently or enjoying better health after operation is 17 per cent larger in the positive than in the negative group (Table V).

It is but just to say that in patients of this kind the vast majority of whom submitted

TABLE V—COMPARATIVE GROUP EFFECT
UPON HEALTH

	Negative group		Positive group	
	Cases	Per cent	Cases	Per cent
Excellent or better	22	54	36	71
Same	13	3	11	2
Worse	6	15	4	7

themselves to the operations for definite and serious complaints, persistence of the symptoms after the operations must be regarded as rank failures as far as health is concerned. Even combining the figures for the unfavorably affected classes, however, that is, those who either did not improve or became worse, a wide margin still remains in favor of the number of patients benefited, whether the latter are considered by groups or as a whole. We like to look upon this finding as nature's reward and as an apparent further indication that after all the highest function of woman is to bring children into the world, at least, under favorable conditions it does not seem to be incompatible with the best state of health.

As to the number of patients who aborted, and the actual number of abortions and of children born before and after the operation, Table VI gives us the data.

TABLE VI—PATIENTS ABORTED, ABORTIONS AND CHILDREN

	Negative group		Positive group	
	Cases	Per cent	Cases	Per cent
Patients who aborted (pre operative)	15	1	29	23
Patients who aborted (postoperative)	5	13	9	18
Actual abortions (pre operative)	28	15	33	28
Actual abortions (postoperative)	7	100	15	12
Children (pre operative)	157		85	
Children (postoperative)	000		106	

The percentages of abortions were figured out from the actual number of pregnancies. There were 2 patients in the negative group who had abortions both before and after operations—one with 5 and 1, and the other with 1 and 3 respectively, and 2 patients in the positive group, with 3 and 1 and 1 and 1 respectively. Neither postoperative complications nor fatalities were recorded among the patients although 6 have subsequently died

since the operation, from other causes, and independently of pregnancy or parturition.

PATHOLOGICAL FINDINGS AND RESULTS

With the tables and figures before us the next natural thing to do appeared to be to determine if possible, the factor or factors underlying the divergent results, hoping that by knowing we may in the future be able to avoid the unfavorable ones and obtain per baps even better results.

We have therefore grouped together the main and associated pathology and therapy in the two groups under consideration, in order to make their comparative study easier and see to what extent their varying lesions and methods of treatment can account for the unequal results. The form and number of lesions, in detail, found in said groups are respectively: laceration of the perineum, 40-55, laceration of the cervix, 8-12, stenosis of the cervix, 2-8, hypertrophy of the cervix, 3-3, endocervicitis, 4-5, endometritis 24-56, metritis 10-4, retroversion and retroflexion, 30-72, prolapse, 11 (3)-13 (1), cystic ovaries and oophoritis, 24 (bilateral)-40 (16 bilateral), salpingitis, 4-2, adhesions, 11-11, and venereal history, 7-5. The main and associated therapy were as follows, also respectively: Dilatation and curettage, 30-62, perineorrhaphy 8-13, trachelorrhaphy, 7-5, oophorotomy, 24-36, and replacement, 40-77.

The lesions which have been found to be most frequently associated among patients in the negative group were laceration of the perineum, endometritis, retroversion or retroflexion and cystic ovaries in 21 per cent, followed by laceration of the perineum, retroversion with or without prolapse and cystic ovaries in 10 per cent. Among patients in the negative group the same lesions were found associated, and with laceration of the perineum, endometritis and retroversion or retroflexion constituted 23 per cent of the lesions each, followed in turn by laceration of the perineum and retroversion or prolapse in 5 per cent. It can thus be seen that the same associated lesions were found more frequently together in both groups, varying only in their relative incidence while they occurred with absolute frequency in each one of them.

We take this to mean that *per se* they neither minimize the chances of further childbearing nor to be sure enhance it. Neither does any other association of lesions appear to do so in particular.

The pathological lesions were further regrouped (Table VII) for the sake of brevity on the basis of whether they were calculated to affect childbearing from a mechanical standpoint. These lesions included lacerations of the perineum, stenoses of the cervix or displacements of the uterus, and from an inflammatory or infectious standpoint lacerations and hypertrophies of the cervix, endocervicitis and the like, but with due regard for the close relation which exists between one and the other. Adhesions, for example, are inflammatory in origin but chiefly mechanical in their effects; lacerations are mechanical conditions but they favor infections and while endocervicitis is essentially an inflammatory process its rôle against childbearing is not only biochemical but mechanical as well. However, cystic ovaries and oophoritis, salpingitis and adhesions were set apart for reasons that will be given a little later.

A glance at Table VII shows a uniformly smaller percentage of lesions among the patients in the positive than among those in the negative group; the difference in percentages being much more marked under "mechanical and inflammatory" lesions. This is explained by the fact, however, that among the patients in the former group about 28 per cent were either single or sterile at the time of their operations; hence they presented fewer infections and no lacerations. The condition of the ovaries, while appearing to be diseased in a somewhat larger proportion of patients in the negative group, can hardly be incriminated for the unfavorable results because as a matter of fact they occurred bilaterally in a larger proportion in the positive group. Where the two groups appear visibly to diverge, however, without adequate explanation is with reference to *salpingitis, adhesions and venereal history*. It is true that the latter lesions occurred in only a small proportion in both groups, but their comparative incidence among patients who ceased bearing children and those who continued bearing children

TABLE VII—COMPARATIVE PATHOLOGY AND THERAPY

	Negative per cent	Positive per cent
Laceration of the perineum, stenosis, retroversion or retroflexion and prolapse	208	193
Laceration of the cervix, hypertrophy, endocervicitis, endometritis and metritis	123	104
Cystic ovaries and oophoritis	59	52
	(23 per cent bil)	(52 per cent bil)
Salpingitis	13	25
Adhesions	28	14
Venereal history	18	39
Dilatation and curettage	74	81
Irradiation	23	17
Oophorectomy	19	65
Oophorectomy	59	47
Replacement	100	100
Clifford or Gilliam-Ferguson's	40	25
Guazzo's	12	28
Internal Alexander's	48	45

after operation is striking and cannot be accounted for otherwise. No further comment about it is considered necessary. It was for this reason that in the regrouping of lesions, salpingitis and adhesions, together with venereal history and cystic ovaries and oophoritis, which two latter have already been discussed, were set apart from other inflammatory or infectious conditions. We satisfied ourselves, of course, that the ages of the males concerned were not in any way responsible for the patients' failures to continue bearing children, except in two instances where one of them was 65 and the other 70, 55 having been set down as a fair limit to male productivity.

A comparison in the number of abortions before and after operation among the patients in the negative group seems to bear out paradoxical as it may appear the belief that hysterectomy probably causes a predisposition to miscarriages; all the 7 pregnancies in the group terminating in as many abortions. At the same time, however, the preoperative and postoperative abortions among those in the positive group lead one to infer that the lesions for which they were operated upon must have been partly responsible for the abortions.

As far as the particular technique employed in replacement is concerned, statistics have been made only of the two methods

which have been most widely used, namely, Gilliam's or its modification by Ferguson, and Guazon's, and judging from their relative frequency in the two groups it does not appear that any of them can be blamed or credited for the results, although the former method can be seen to have been much more frequently used among the patients in the negative group than the latter.

We believe that, on the whole, our results compare favorably with those reported on similar available studies made elsewhere (Table VIII), taking into consideration that our patients were practically all clinic patients among whom the immediate postoperative care and the physical relaxation necessary for some time after leaving the hospital are not of the best nor often even to be had.

TABLE VIII—COMPARATIVE RESULTS BY DIFFERENT AUTHORS

	Beyea per cent	Gies per cent	Cragin per cent	Rossier per cent	Bissell per cent	Ours per cent
Replies	68	?	41*	?	?	49
Bearing children after operation	24	33	18	10	5	7
Dystocia after operation	13	9	1	0	?	24(?)
Abortions after operation	23	7	7	4	8	?
Operative mortality	0	20	?	0	25	?
Obstetrical mortality	0	38	?	0	?	0
Excellent or better after operation	95	50	?	?	?	61

Including 5.4 per cent who were pregnant at the time of reading the paper.

It should be stated that the above comparison is only partial and approximate as in the majority of instances, unfortunately, no reference was made by the authors as to the age and social condition of their patients.

No effort was made at this time to give figures as to the "anatomical" success of the operations, especially with reference to the uterus, inasmuch as only in a few instances was a reexamination of the patients possible. Admitting, however, that a condition of well being is not necessarily incompatible with the presence of an anatomical displacement, as witness the existence sometimes of silent lesions, we believe that from the larger standpoint of the patient's welfare it does not really matter whether any particular organ is incorrectly placed if it gives rise to no symptoms.

All the percentage figures used in this paper are absolute in the sense of having been figured out from the actual number of patients who have given definite information on each and every data required of them. Patients giving incomplete or doubtful data were accordingly excluded—an average of 20 per cent.

Altogether there were 377 patients with a total of 530 addresses. Of these, 16 private patients with 25 addresses were excluded. Information was obtained directly by letter from 129, and indirectly from 44 patients. A number of the patients had to be written to twice and a few thrice. Two hundred thirty-nine addresses were returned, the rest were either unreturned or remained unanswered.

SUMMARY

Surgical replacement of the uterus and minor associated procedures do not appear to affect unfavorably pregnancy, parturition and health. This is shown by the larger number of patients who have borne children (48 against 25 per cent), delivered normally (80 against 10 per cent), and reported to be doing excellently or enjoying better health after operation (61 against 39 per cent) than those who reported otherwise.

A larger number of patients is reported to be doing excellently or enjoying better health among those who continued or commenced bearing than those who ceased bearing children after operation (71 against 54 per cent).

Venereal history, salpingitis and adhesions were found to be proportionately much more frequent among patients who ceased bearing children than among those who continued or commenced bearing them after operation (59 against 20 per cent).

BIBLIOGRAPHY

- BEYEA H D. Replacement of the uterus, etc. *Pennsylvania M J*, 1905 viii 4.
 CILES A L. A study of the after results of abdominal operation (144 patients) on the pelvic organs. *London 1910*. Cited by Kosmak G H. *Bull Lying in Hosp of New York*, 1915 v 52.
 CRAGIN E B. Operative treatment of retroversion of the uterus (400 patients). *Surg Gynec & Obst*, 1915 xx.
 KOSSIER G. Les methodes de fixation de l'utérus et leurs suites obstétricales (200 patients). *Rev méd de la Suisse Rom*, 1915 xxxv 686.
 BISSELL D. Surgical treatment of the retroposed uterus (185 patients). *Am J Obst*, 1916 lxxiv 1.

MALIGNANT MELANOMA OF THE VULVA

WITH REPORT OF THREE CASES

By J I COFORTH M D PHILADELPHIA

From the Laboratory of Melanoma Anatomy, the Philadelphia General Hospital

MALIGNANT pigmented tumors springing from the external genitalia of the female fortunately are rare but they are of sufficient importance to justify their consideration separately although in general the symptoms they produce and their course are quite similar to those of melanomata arising elsewhere. Melanomata as a whole have been extensively studied and reported upon by many investigators and different views regarding their histogenesis have obtained at different times. Ewing (4) in reviewing the literature presents all of the various theories relating to the subject but he is inclined to the view that these tumors are of epidermal origin. In a recent exhaustive study Dawson (3) proves rather conclusively the epidermal origin of pigmented tumors and interprets the diversity in structural arrangement and cell type seen in practically all of such tumors as being due to the amazing power of anaplasia and redifferentiation of the epidermal cell. The term melanoma designating and emphasizing the specific character of the cells which give origin to the growth has been introduced and is now commonly used as a group name for all of the pigmented tumors in preference to such terms as melanoma sarcoma and like terms.

The malignant melanomata can be shown to have originated from pigmented moles or naevi in the majority of cases. Naevi are most commonly found on the face neck and back but may occur anywhere. Bland Sutton (1) points out that the skin about the genital organs is normally rich in pigment and Frank (5) and Reed (9) state that pigmented spots or moles occur rather frequently about the vulva. In this location they are particularly subject to the influence of chronic irritation inflammation and trauma—factors which are instrumental in inducing the change into malignancy. Yet relatively few cases of malignant melanoma originating from vulval

moles have been recorded in the literature. Holland (7) in 1908, reported a case in which the primary growth was near the clitoris. He collected 52 cases from the literature 37 of which could be definitely accepted as undoubted vulval melanomata. Of these 12 were located on the labium majus, 15 on the labium minus and clitoris 1 near the urinary meatus 1 on the mons veneris and 8 involved the entire vulva. Veit (10) in reviewing the literature on the subject, cites three cases primary on the labium majus not mentioned by Holland. Hirst (6) saw 2 cases, both primary on the left labium majus one occurring during pregnancy and ending fatally in 4 weeks. Lockhart's (8) case arose from the clitoris in his report he mentions a similar case seen by LaFleur and cites Versey's similar case. Reed's (9) interesting case involved the urinary meatus and was successfully removed. Broders and McCarty (2) in a study of 70 cases of malignant melanoma found two springing from labial moles. Dawson (3) traced of a group of 36 cases to vulval origin.

The following case abstracts were obtained from the records of the University of Pennsylvania Hospital and the Philadelphia General Hospital. I am indebted to Dr John G Clark and Dr Charles C Norris for the privilege of reporting them.

CASE 1. E. K., a white married woman of 36 entered the University Hospital in March 1921. She stated that during pregnancy in 1914 a tumor had grown on the left labium majus. This was removed by Dr Koehler of Switzerland at that time and was stated definitely to have been a melanotic tumor. There had been no further trouble until 1919 when a small nodule again appeared at the same site and was excised with wide margin. Six weeks before admission a third tumor appeared at the same place. This had grown fast with considerable pain about the vulva. Physical examination was essentially negative except for a brownish growth the size of a hazelnut on the anterior portion of the labium majus.

Wide excision and a left inguinal adenectomy were performed by Dr Clark March 23 1921. Within 6

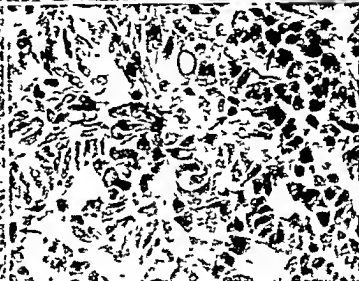
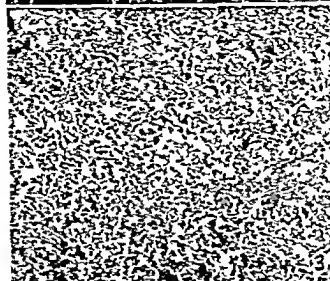
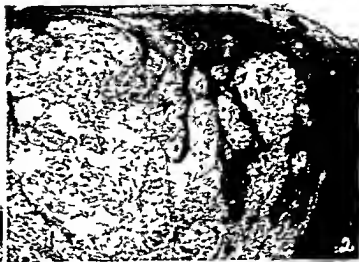


FIG. 1. Case 1. Low power photomicrograph (110 X) showing a portion of the benign pigmented nevus located near the malignant vulval growth. The arrow points to a mass of "nevus" cells in the corium.

FIG. 2. Case 1. Low power (110 X) portion of malignant pigmented mole excised from labium majus in March, 1931. Note proliferation of tumor cells from epithelial processes of epidermis as well as from nests of "nevus" cells in corium.

FIG. 3. Case 1. Low power (110 X) photomicrograph of recurrent growth which was removed in February, 1933. Note the patterning and the structureless arrangement of cells.

FIG. 4. Case 1. High power (460 X) photomicrograph of same field as shown in Figure 2. Note fat spindle-shaped cell. The arrows point to cell division stage and to pigment-laden cell.

weeks the growth again recurred. This was radically excised with the cautery knife September 30, 1931. It was not until January, 1933, that further activity manifested itself and February 16, 1933, the fifth labial growth, with a wide zone of healthy tissue surrounding it, was removed with the cautery irradiation following. The further course of the neoplasm is not known. The patient returned to Germany shortly after this last operation and died in November, 1933, presumably from a fatal recurrence.

Post-mortem study. (This we removed a operation in March, 1931.) The excised portion of the labium measures 6.5 by 3.5 by 2 centimeters. The outer surface is covered by skin which is slightly pigmented. At one extremity of the specimen a rounded nodule 8 millimeters in diameter protrudes above the skin surface. At the other end a small peduncu-

lated brownish growth 4 millimeters in diameter and grossly resembling a pigmented nevus is observed.

Microscopic study. Sections through the larger nodule show a nevus undergoing malignant change. The basal layer of the epidermis covering the mole is quite irregular with many epithelial processes dipping down and fraying out into the tumor proper. Numerous small nests of cells morphologically similar to the tumor cells are included in the deeper portions of the epidermis. Beneath the epidermis many nests of cells centrifugally enlarging are seen. In the main these tumor cells are large irregularly cellate polygonal or rounded, and contain rather large rounded vesicular nuclei many of which contain large oval deeply staining nucleoli. They grow without structure formation but group about the

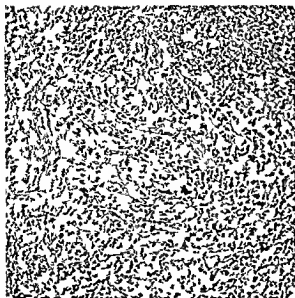


Fig. 3. Case 1. Low power (110X) view showing general structure and arrangement of growth. Many of the cells are packed with melanin.

scanty skeletal connective tissue that is present sometimes suggesting an alveolar arrangement. Many of the cells are packed with dark brownish pigment granules. Sections through the pedunculated growth give a rather typical picture of a benign pigmented nevus. Beneath the epidermis there are masses of closely packed nevus cells. These show no tendency to grow or invade.

The recurrent vulvar growth removed in February, 1923 is well defined mainly subcutaneously situated measures 3 by 2 by 2 centimeters and on section presents a mottled purplish brown and a smooth homogeneous cellular appearance. Histologically the tumor is composed chiefly of rounded polygonal and fat spindle shaped cells relatively constant in size closely crowded together deeply staining and with many karyokinetic figures. There is a tendency for the cells to assume an alveolar arrangement in places but in the main they grow in structureless manner. Black granular pigment is present in many of the cells.

CASE 2. The patient a white woman aged 66 entered the University Hospital in March, 1916 complaining of a growth on the left labium. It had started as a small boil 2 years previously and had gradually grown larger. There had been pain in the groins and local discomfort for the past few months. Four months prior to admission the growth had become ulcerated and was now found to be discharging.

Physical examination revealed a brownish purplish tumor about the size of a lemon growing from the upper part of the left labium majus. The left inguinal nodes were enlarged and tender. Otherwise the physical findings were of no importance.

The tumor and right and left inguinal nodes were removed by radical excision by Dr. Clark shortly after admission. The patient made an uneventful recovery and when last heard from in November, 1923, 7½ years after operation was well and free from recurrence.

Pathological study. The labial mass measures 10 by 8 by 5.5 centimeters. The external surface is covered by thick wrinkled skin from the center of which projects a rounded friable brownish ulcerating growth 6 by 5 centimeters. A section discloses firm whitish fibrous tissue about the periphery of the tumor while the deeper portions present a lobulated brownish mottled cellular appearance. All of the several lymph nodes are soft slightly enlarged and grayish on section.

Microscopic examination. Throughout the various sections taken from the growth diffusely scattered masses of closely packed deeply staining cells for the most part stellate oval or irregular in outline fairly constant in size and showing no patterning or attempt at structure formation are seen. The cell nuclei are quite large and often large rounded nucleoli are noted. The cytoplasm is scanty and granular. Study of the epidermis at the edge of the tumor shows an active basal layer and occasionally epithelial processes can be demonstrated extending down from this layer and fading out into the tumor proper. Here and there unevenly distributed are deposits of brownish pigment in fine droplets both intracellular and extracellular. This pigment does not respond to the Russian blue reaction for hemosiderin. Sections through each of the lymph nodes show no metastasis; there are acute and chronic inflammatory changes present.

CASE 3. I. M. S., a white female married aged 56 entered the Philadelphia General Hospital Dr. Norris service in a moribund condition. She died before any history could be obtained. A summary physical examination revealed generalized wasting coarse rales throughout the lungs ascites and tympanites and a black tumor the size of a lemon growing from the right labium majus.

At autopsy (performed by Dr. John Eiman) the vulvar growth was found to be irregular and nodular measured 7 by 6 by 2 centimeters and was located on the anterior half of the right labium. A section was cut and several brownish black tumor nodules 4 to 14 millimeters in diameter were demonstrated beneath the skin surface in addition to the black nodules protruding above the skin level. The inguinal nodes were enlarged soft and friable and black. Three thousand cubic centimeters of dark brownish fluid were recovered from the peritoneal cavity. The peritoneum pericardium and pleura were studded with innumerable brownish to black nodules many of which were flat. The peritoneum of the lower abdomen was practically a black sheet of neoplastic tissue. Several tiny black nodules were seen in the heart wall particularly on the right side. The lungs liver spleen kidneys and adrenals were studded with myriads of tumor nodules those in the

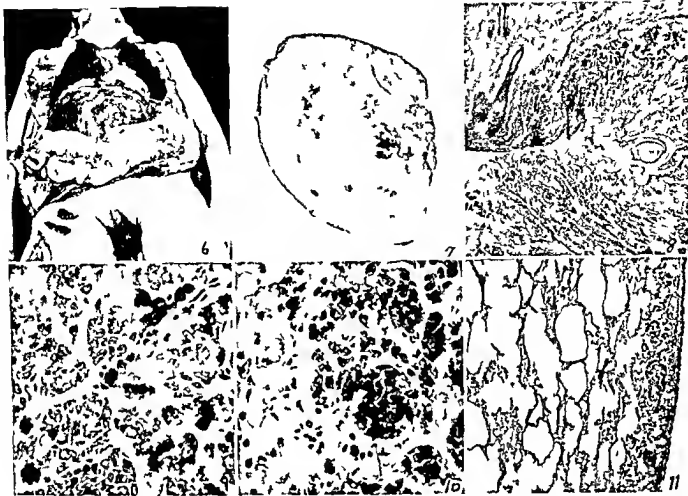


Fig 6 Case 3 Photograph taken at autopsy showing vulval growth and widespread metastases. Note greatly enlarged liver, the usual finding in generalized melanosis.

Fig 7 Case 3 View of calvarium showing many second ary black tumor nodules in the skull bones.

Fig 8 Case 3 Low power (110 X) view of section taken through edge of vulval growth showing actively proliferating epidermis.

Fig 9 Case 3 High power (460 X) photomicrograph

showing structure and cell type of deeper portion of vulval growth. The cells are epithelial in appearance and many contain enlarged deeply staining nucleoli. Several cells are packed with melanin.

Fig 10 Case 3 High power (460 X) view of liver metastasis. The cell morphology is a reduplication of that noted in the primary growth.

Fig 11 Case 3 Low power (110 X) view of metastasis to lung subpleurally located.

liver ranging from pin point size to 5 centimeters in diameter. The uterus ovaries and urinary bladder wall contained a few tiny coal black nodules. The bone marrow of the femur was diffusely brownish black, that of the tibia was yellowish with many tiny black nodules scattered throughout. The skull was peppered with bluish black growths and the brain showed numerous small metastases. The muscles of the abdominal wall and extremities were wasted and many tiny tumor nodules were demonstrated. Numerous small subcutaneous, slate colored nodules, 1 to 3 millimeters in diameter, were noted.

Histological study. Sections taken from the vulval growth show a neoplasm composed mainly of rather closely packed deeply staining large round, and polyhedral shaped cells that are fairly uniform in size and which have large oval shaped, vesicular nuclei, many with prominent, deeply staining

nucleoli. Cell division stages are frequent. An occasional giant cell containing two, three or four large nuclei is seen. Many of the cells are distended with black granular pigment, which is negative to the Prussian blue reaction. The cells grow haphazardly in the scanty fibroreticular supportive tissue in structureless manner essentially, but there is a tendency for them to group together in small nests and cords here and there. Sections through the edge of the tumor show a proliferation of epithelial cells apparently springing from the basal layers of the epidermis and becoming a part of the tumor. Intracellular and inter cellular pigment is seen in small patches of partly differentiated cells all along the basal layer of the epidermis and in the epithelial processes of the rete Malpighi. Although no prickles or "pearly bodies" are anywhere demonstrable the cells are morphologically epithelial in type, and the picture is that of a "melano carcinoma".

The metastases all present a remarkably constant picture—a striking reduplication of the primary growth both as to cell type and structure. The tumor cells maintain their epithelial appearance throughout. The amount of pigment varies in the different metastases and in all sections is both intracellular and extracellular.

Histologically Case 3 is clearly a melanocarcinoma. Cases 1 and 2 although presenting chiefly a sarcomatous picture can be traced to epidermal origin. A history of the existence of a benign pigmented mole or spot before the malignant tumor developed is lacking in each case. In Case 1 a benign pigmented nevus was demonstrated near the primary malignant growth. In no case does the history suggest what factor or factors may have been active in initiating the change into malignancy. Pregnancy is thought to hasten the course of the disease yet Case 1 with a history of a melanotic tumor occurring and being removed during pregnancy went 5 years without recurrence.

Practically all of the cases of malignant melanoma of the vulva that have been reported terminated fatally in a relatively short time after treatment. Veits (10) search of the literature revealed only four cures and two of these were of short duration. Only one of Holland's (7) 57 collected cases was free from recurrence 3 years after operation. Of our series Case 2 was well without signs of recurrence 7½ years after radical treatment. Case 1 with the remarkable history of four recurrent labial growths 5, 7, 7½ and 9 years respectively after the primary growth finally terminated fatally 9½ years after the initial appearance of the growth. It would appear that radical operative procedure at least retarded the disease in this case even though the hoped for eradication was not accomplished.

Postoperative irradiation proved of little or no value in arresting the progress of the disease in this case; there is some evidence however that relief of pain to a helpful degree was afforded. Case 3 when first observed was in a moribund condition from generalized melanosis.

We feel emphatically that malignant melanoma of the vulva should be essentially a preventable disease. A pigmented nevus or

spot about the vulva, or elsewhere, even though apparently innocent in appearance is potentially malignant and its presence should command respect, careful attention, and prompt and proper treatment. The presumably benign nevus should be excised with a wide margin of healthy tissue surrounding it in all directions. Those showing unusual symptoms and signs such as enlargement, increased vascularity or ulceration should be radically removed preferably with the cautery knife together with the regional lymphatic system. Hogarth Pringle quoted by Dawson (3) states that a radical extirpation of the disease will be most certainly ensured by excision of the tumor with a good zone of healthy skin around it and a somewhat larger zone of the underlying deep fascia up to and including the nearest anatomical group of glands at least and all that is removed should be in one continuous strip as far as possible. The same dictum applied more radically holds for those cases that are very definitely malignant and for those that show recurrent growths.

After the malignant transformation of a nevus growth is rapid and metastasis occurs relatively early. Generalization occurring usually within 3 years from the time of evidence of malignant change in the primary growth establishes itself through direct invasion of a vein or capillary from either the growth itself or involved lymph nodes or from the lymph glands directly through the thoracic duct to the blood stream. With this course of the disease in mind it follows that the proper sequel to proper treatment is a frequent follow up and thorough examination of the patient. Such a system gives the patient the obvious advantage of the earliest treatment of a local recurrence, and permits at the same time the surgeon to know the true results of his treatment.

SUMMARY

1. Three cases of malignant melanoma of the vulva all primary on the labium majus are reported.

2. Our studies and those of others, indicate that the melanomas are of epithelial origin.

3 Vulval pigmented nevus should be regarded as being potentially malignant, and should be treated by excision, with a wide margin of apparently healthy tissue in all directions

4 Vulval nevus showing unusual behavior should be thoroughly removed together with the regional lymphatic area

5 The proper treatment for those cases in which malignant change is well established or in which recurrence exists, consists in a radical application of the above

6 A rigid and frequent "follow up" of the patient is necessary if the patient is to be given the advantages of the earliest treatment of a local recurrence, or if a "cure" is to be proved

REFERENCES

- 1 BLAND SUTTON J Tumors Innocent and Malignant 7th ed New York P B Hoeber, 1922 p 122
- 2 BROWERS A C and MACCARTY, W C Melano epithelioma Surg, Gynec & Obst 1916 xviii 28
- 3 DAWSON J W The melanomata their morphology and histogenesis Edinburgh M J 1925, xxii 501
- 4 EWING JAMES Melanoma Neoplastic Diseases 2d ed Philadelphia W B Saunders and Co, 1922 p 871
- 5 FRANK R T Gynecological and Obstetrical Pathology New York D Appleton and Co, 1922 119
- 6 HIRST B C Textbook of Diseases of Women 2d ed Philadelphia W B Saunders and Co 1905, p 127
- 7 HOLLAND E Malignant melanoma of the vulva Brit J Obst & Gynec, 1908 xiv 309
- 8 LOCKHART, F A I Melanotic sarcoma clitoridis Brit J Obst & Gynec 1912, xvi 85
- 9 REED C A L Textbook of Gynecology 2d ed New York D Appleton and Co 1904 p 230
- 10 VEIT J Handbuch der Gynaekologie 2d ed 1908 iv 746

SARCOMA OF THE PROSTATE

REPORT OF A CASE WITH A DIGEST OF THE LITERATURE

BY RICHARD R. SMITH, M.D., F.A.C.S. AND WILLIAM R. TORGIERSON, M.D., GRAND RAPIDS, MICHIGAN
From The Grand Rapids Clinic

SARCOMA of the prostate is one of the rarer tumors. A search of the literature however reveals 83 authentic cases. To this we are adding our own case, bringing the number to 84.

Our patient was a married man, age 31. He was in good health except for the prostatic condition. His first symptom was sudden retention of urine which was relieved by the use of a catheter but as he continued to have pain on urination and difficulty in voiding he came to us 2 weeks after the onset of symptoms. Rectal examination revealed a large smooth mass about the size of an orange occupying the position of the prostate. The tumor was so soft that we thought that we might be dealing with a cyst of one of the seminal vesicles. The cystoscope revealed an even bulging at the base of the bladder which appeared otherwise normal.

We operated upon him in August 1924. Approach to the tumor was made through the perineum. The tumor was easily exposed and proved to be soft and solid of light color somewhat resembling a fibroid. It was shelled out in two large pieces with moderate bleeding and the material immediately submitted to the pathologist who made a freezing microtome examination and returned a preliminary diagnosis of sarcoma.

Relief of symptoms was of but short duration. The subsequent clinical history was what one might expect from a rapidly growing extremely malignant tumor in this region. Deep X-ray therapy was resorted to in the hope of checking the growth but without success. Later we opened the bladder from above with the idea of inserting radium but we found that the growth had advanced so far in the 8 weeks since operation that the radium was not used. In that period the tumor had filled the pelvis and had invaded and projected through the bladder wall filling it with a large fungoid excrescence. The cystotomy wound was left open for drainage and relief of pain from distention. During the last 2 months the patient complained of a great deal of pain radiating down his right thigh for which morphine was freely administered. There was considerable swelling of the right leg. He rapidly lost weight and color and died about 4 months after the acute retention of urine which had been his first symptom.

Postmortem examination. The body showed the emaciation and cachexia of one dying from a malignant tumor. In the skin over the body were numerous small petechial hemorrhages. At the site of the

perineal wound was a projecting mass cylindrical in shape about 2 inches long and 1.5 inches in diameter. This was removed for examination. Upon opening the abdomen the pelvis was found to be filled with the new growth which had invaded the bladder, urethra and rectum. On the right side it had extended upward pushing the right iliac vessels and nerves before it so that they were under considerable tension. This accounted for the pain and the edema in his right thigh and leg which had been present during the latter weeks of his illness. In the testicular wall were noted small petechial hemorrhages similar to those in the skin. These possibly represented emboli made up of sarcoma cells although this was not established conclusively. Metastases were noted in the regional lymph glands and the fourth lumbar vertebra. Upon examination of the thorax the left tenth rib was found to be involved. The pleura especially on the left side was literally studded with metastatic nodules. Numerous secondary growths were found also in both lungs.

A photograph of a section of the tumor and its metastases and a number of photomicrographs are reproduced here. William McK. Cerman, pathologist of Blodgett Memorial Hospital, Grand Rapids submitted the following summary of his microscopic examination. Sections of the primary tumor show far advanced rhabdomyosarcoma with a tendency to form muscle fibers. Sections of the metastases show increased tendency toward anaplasia with diminished formation of muscle fibers. These structures resemble the spindle cell type of fibroblastic sarcoma rather than the muscle forming type. There is in both the primary and metastatic nodules marked tendency to hemorrhage and the blood vessels throughout consist of a single layer of endothelial cells. There is evidence everywhere of very rapid growth and anaplasia of the cell type. Histological diagnosis: rhabdomyosarcoma of the prostate with multiple metastases. Terminal toxic degeneration and atrophy of all organs.

LITERATURE

The literature on this subject is made up largely of case reports. There are however four outstanding articles in which the subject has been dealt with more fully. The first one was published by Proust and Vign (24) in 1907 entitled "La sarcom de la prostat." In this article all the literature up to that time

was thoroughly reviewed and a brief summary of each reported case was given. They collected 58 cases which they divided into four groups: (1) six cases in which the involvement was secondary, the primary being in some adjacent organ, (2) four cases in which the diagnosis was very doubtful, (3) fourteen cases that were probable, but in which the histological evidence was wanting, (4) thirty-four cases in which the diagnosis was certain. (These are the only ones used in our article.)

From an analysis of these cases they found that 44 per cent occurred before the age of 10, 29 per cent between 30 and 50, and 20 per cent after the age of 50. Our statistics based upon a larger number of cases show some little variation from these figures. They observe that the round cell type is the most frequent, constituting 32 per cent and the spindle cell type next forming 18 per cent. They also deduced from this experience that under the age of 10 the spindle cell type is the most common.

Descamps (8), in 1912, was the next author to give a comprehensive consideration of the subject. He reports 55 cases, 41 of which he classifies as certain and 14 as probable. He considers the subject fully from the historical, etiological, symptomatic, and pathological aspects and discusses diagnosis and treatment. His conclusions coincide in the main with our own and for the sake of brevity are omitted.

In 1922 Putzu (25) published an article in which the clinical aspects of the disease are most ably presented. In our discussion of this phase of the subject we shall refer to this article again.

The last article was one published in 1923 by Bettom (1) entitled "Ueber einen eigenartigen Fall von Sarkom der Prostata." The patient complained of abdominal pain. Examination revealed a large mass in the region of the spleen. Very shortly afterward, a matter of 72 hours, he died, having suffered with nausea and vomiting, severe abdominal pain, distention, and cardiac failure. In the routine examination, the prostate had been palpated, but had been found to be of normal size and consistency. Postmortem examination re-

vealed a small primary sarcoma of the prostate with large secondary involvement in the spleen, both kidneys, liver, and left suprarenal.

He follows the report of his case with a discussion of the subject based on an analysis of 41 cases reported in the German literature. He comes to the following conclusions: (1) The condition is most common during the first decade of life. (2) The duration of life has a direct relationship to age—the older the patient the longer the duration. (3) The symptomatology is not uniform. (4) The tumor may present either as a perineal or abdominal one. (5) The tumor is frequently soft but as a rule it is firm. (6) In 80 per cent of the cases there was extension to surrounding parts as found at postmortem, in 47 per cent there were metastases to distant organs and in 53 per cent no metastases. (7) From a histological standpoint sarcoma of the prostate comprises a large group of tumors of widely different cell structure. (8) The most rapid growing types are the rhabdomyosarcoma and lymphosarcoma. The slowest growing is the spindle cell sarcoma. The lymphosarcoma and round cell sarcoma produce the most metastases. (9) The results of operation have not been satisfactory. (10) Radium probably offers the best therapeutic means which we have at hand.

The accepted textbooks give rather scanty information on the subject and much that is erroneous. For example one writer (19) makes the statement that the condition is not found in adult life. The literature conclusively disproves this. Others state simply that it is a disease of infancy and childhood. Another writer (Ewing, 11) makes the statement that he questions that lymphosarcoma ever occurs in the prostate, as the structure of the gland does not favor the occurrence of such tumors. Thus it would seem is not correct. Very little can be learned from the textbooks in regard to the relative malignancy of the various types, the frequency of their metastases, or their location.

We thought that data that would be valuable to the clinician could perhaps be obtained from an analysis of the 84 cases that we have brought together.

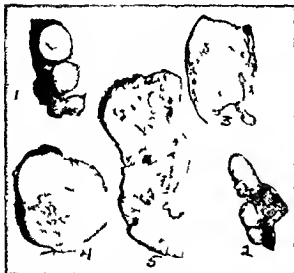


Fig. 1 Gross photograph showing lung metastases (1 and 2) large pleural metastasis (3) and cross sections of primary extensions showing hemorrhagic tendency (4 and 5)

AGE

Reference to the Table I will show that in 30.5 per cent of the reported cases the sarcoma occurred during the first 10 years and that it is more common during that decade than during any later one. In about 60 per cent however it occurred in adult life (over 20 years). Herrick (15) brings out the fact that in almost 75 per cent of the cases the growths occur before the cancer age of 40 years and in about 80 per cent before the usual age of prostatic adenoma (50 years). He concludes therefore that a prostatic tumor occurring before 50 years of age is possibly sarcoma, and one occurring in adolescence is probably of such a nature. Descum (7) states that after childhood old age gives the largest number of cases. Other writers have

TABLE I—AGE INCIDENCE BASED ON 82 CASES (IN 2 CASES AGE NOT GIVEN)

Age	No.	Per cent
0-10	25	30.5
11-20	9	10.9
21-30	11	13.4
31-40	12	14.6
41-50	10	12.2
51-60	10	12.2
61-70	3	3.6
71	7	8.4
	82	99.8



Fig. 2 Photomicrograph of section of primary extension through perineal incision. Note the abortive attempt to produce muscle cells and fibers

also made this statement but the statistics do not seem to substantiate this conclusion.

CLINICAL PICTURE

It has been stated by some writers that sarcoma of the prostate presents two different clinical pictures depending upon whether it occurs in a child or in an adult. Putzu (5) in commenting upon this says that the distinction is artificial and scholastic. Whatever difference prevails is due to the rapidity and extent of the growth.

Symptoms. At all ages the onset is insidious. The first symptoms are almost without exception related to either the rectum or the bladder and present themselves as a partial bowel obstruction, or by difficulty in urination or sudden complete retention as in our patient.

In the child the growth is usually rapid and as a consequence an acute retention or partial bowel obstruction or both is apt to be the first symptom. In the adult the development is usually less rapid and these symptoms are more apt to present themselves gradually. Pain, which is sooner or later almost always present is of two kinds that produced by obstruction of rectum or bladder and essential pain located deep in the pelvis and not dependent upon urination or defecation. It is severe lancinating and interferes with rest and sleep. It may radiate in almost any



Fig 3 Photomicrograph of section through the margin of lung metastasis (low power) showing the compression of the surrounding lung alveoli by the expansive growth of the neoplasm. In this metastatic growth there is little tendency to form the more adult muscle cells.

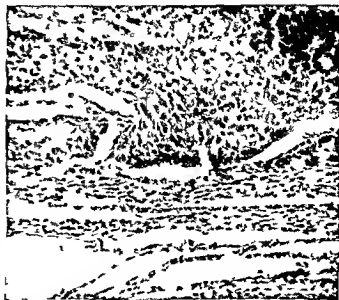


Fig 4 Photomicrograph (high power) of same section of lung metastasis same field showing masses of hyperchromatic tumor cells and no visible formation of muscle substance. An example of extreme anaplasia.

direction, but its common course is through to the sacrum or down the limbs to the knees.

Hæmaturia is sometimes present, particularly in the adult. In fact, Putzu (25) believes that it is more common than usually stated. The hæmaturia is the result of either ulceration of the bladder or of a diffuse extension of the growth throughout the wall. A secondary anaemia, an oedema of the extremities, resulting from obstruction of the venous return, and cachexia are late symptoms.

The absence of pelvic symptoms is very rare after the disease has manifested itself. In only one reported case, that of Bettom (1), did this situation obtain.

b Size The size varies, the tumor in two cases (1 and 26) was so small as to escape examination. In a number of cases it was as large as a child's head, filling the whole pelvis and extending to the umbilicus. As a rule the prostate on rectal examination is found very much enlarged, particularly in the child. The contour is usually, although not always, smooth and its consistency firm as opposed to a carcinoma, which is, as a rule, more or less

nodular and hard. In many cases it is described as cystic or soft.

c Complications Because of bladder retention or ureteral compression, it is not uncommon to note such complications as cystitis, pyelitis, or pyelonephritis. As a terminal condition peritonitis or bronchopneumonia may supervene.

d Differential diagnosis It is easier to diagnose this condition in children than in adults. One must exclude tuberculosis (which is rare) or a possible abscess. Neither of these conditions should cause any confusion.

In an adult the differential diagnosis is not so easy. Here we must exclude hypertrophy of the prostate, carcinoma, echinococcus cyst, cyst of the seminal vesicles, abscess, and perhaps tuberculosis.

PATHOLOGICAL PICTURE

The histological classification of sarcoma of the prostate has given rise to a considerable diversity of opinion among pathologists. It is not our purpose to discuss this further than to point out marked variance of opinion. Of more importance to the clinician, at least, is the question of metastases which we have gone into more fully.

Histology Many different types of sarcoma of the prostate have been described (Table II).

TABLE II—TYPES (HISTOLOGICAL)
BASED ON 84 CASES

Type	No of case	Per cent
Round cell	30	36.00
Spindle cell	17	20.40
Rhabdomyosarcoma	6	7.05
Myxosarcoma	6	7.05
Mixed cell	6	7.05
Lymphosarcoma	5	5.88
Sarcoma	4	4.70
Angiosarcoma	3	3.52
Fibrosarcoma	2	2.35
Chondrosarcoma	2	2.35
Adenosarcoma	1	1.17
Leiomyosarcoma	1	1.17
Giant cell	1	1.17
	84	99.86

The result of this analysis coincides with the usual statement that the round cell type is first in frequency and the spindle cell type next. Some writers notably Ewing (11), feel that while these types are the most frequent they are also the least definite in their histology no uniform description applying to them. Ewing mentions the rhabdomyosarcoma as the only well defined variety. McFarland (19) on the other hand would classify those tumors containing heterologous elements as striated muscle in the group of mixed tumors and not in the sarcoma group at all.

Referring to Ewing again he questions the possibility of lymphosarcoma ever occurring in the prostate because of the lack of cell structure favoring the formation of such a tumor. In our list there are five cases of lymphosarcoma reported. Three of these are apparently unquestionable cases the one of Couplands which was accepted by the Morbid Growths Committee of the London Pathological Society in England after a thorough investigation the case of Quimby's and the case of Symmers recently reported. In Symmers's report the fact is brought out that there are numerous primitive lymph nodes in the prostate and the question is raised as to why they should not serve as a source of this type of sarcoma here as elsewhere.

METASTASES

1 *Incidence* We have definite evidence of distant metastases, established by necropsy, in about 40 per cent of the cases. In 72 per

cent of the cases local extension to the bladder, rectum, urethra or perineum is found. As would be expected local extension is more frequently found than distant metastases. These figures are not accurate of course because of the failure to secure autopsies in so many cases. We would be inclined to believe that extension and metastases are more frequent than reported. As a rule there is local extension wherever distant metastases are found. This is not always true there being four cases reported with distant metastases and no local extension. Judging from the material at hand it is evident that metastases may occur very early. We find nine cases with distant metastases in which the symptoms had existed 4 months or less. Bettoni, (2) reports a case of Plöschner's with extensive metastases to the kidney, suprarenals, liver, spleen, bone marrow, and the portal lymph nodes, in which the symptoms had existed but one month.

It is of interest to note that distant metastases are apparently rarer before the age of ten only 4 such cases being reported. This may be because in children the local growth is very rapid, and death takes place as a result of some complication secondary to this rapid local development before metastases have time to form (Table III).

2 *Location of metastases* Metastases are found in nearly every organ. Table IV is based upon the 34 cases in which metastases were found and is arranged in the order of their frequency.

It is evident that metastases are very apt to occur in the osseous system. The ribs and

TABLE III—INCIDENCE OF METASTASES ACCORDING TO DECADES BASED ON 82 CASES (* CASES NO AGE GIVEN)

Age	No of cases reported	No. of metastases	Per cent	No. of metastases	Per cent
0-10	25	15	60	4	16
11-20	9	4	44	3	33
21-30	11	8	72.7	5	45
31-40	12	12	100	8	66.6
41-50	10	9	90	5	50
51-60	10	8	80	5	50
61-70	3	3	100	3	100
71-80	2	0	0	1	50
	82	59	72	34	41.4

TABLE IV — LOCATION OF METASTASES BASED ON 34 CASES SHOWING DISTANT METASTASES

Organ	No	Per cent
1 Bone	11	33 34
2 Lung	11	33 34
3 Kidneys	8	23 52
4 Liver	8	23 52
5 Mesenteric glands	7	20 58
6 Spleen	6	17 64
7 Portal lymph glands	5	14 70
8 Pleura	4	11 76
9 Suprarenal	3	7 82
10 Intestines	3	7 82
11 Pancreas	2	5 88
12 Thyroid	2	5 88
13 Abdominal wall	2	5 88

Following organs dura brain gall bladder stomach mesocolon peritoneum epicardium bone marrow psoas muscle axilla scrotum

1 each 2 94

TABLE V — RELATION OF VARIOUS TYPES OF TUMOR TO AVERAGE DURATION OF LIFE

Type	No of cases	Average days
Sarcoma	4	95
Round cell sarcoma	30*	144
Myosarcoma	6†	143
Lymphosarcoma	5‡	163
Chondro-sarcoma	2	255
Spindle cell sarcoma	17	410
Angio-sarcoma	3	450

*4 cases, no duration given

†1 case no duration given

‡2 cases no duration given

TABLE VI — AVERAGE DURATION OF LIFE ACCORDING TO DECADES

Age	Average duration months
0-10	4
11-20	5½
21-30	11½
31-40	6½
41-50	22½
51-60	11½
61-70	6½
71	24

vertebrae are common sites. With equal frequency they occur in the lungs. Since X-ray examination would usually show such metastases, it would seem wise in every case of sarcoma of the prostate to make X-ray examination of chest and spine before any treatments were begun.

Local extension occurred in 59 patients or 72 per cent of all reported cases (Table III).

In this number, the bladder was most frequently involved, extension to this structure occurring in 41 of the cases, 70 per cent. The urethra was next in frequency with 23 cases, 40 per cent. The rectum followed with 11 cases, then the immediately surrounding tissues with 8 cases, and finally the seminal vesicles with 4 cases.

In Table V we have arranged the various types in their relation to the average duration of life.

The first group of unclassified sarcomata may be disregarded. Other groups are so small in number that their relative malignancy may not be correctly estimated.

However, it may be fair to conclude from this classification that the round cell type is the most malignant. Fourteen patients out of a total of 84 lived 2½ months or less after the onset of symptoms. Of these, 10 showed round cell sarcoma, 75.5 per cent. The patient living the shortest time died 11 days after the onset of symptoms and showed a round cell sarcoma.

One may also conclude that the spindle cell tumors, along with the less cellular ones, as the angio, rhabdo, fibro-, and leiomyo sarcomata are the least malignant.

TREATMENT

At the present time the treatment is largely palliative and consists usually in relieving urinary obstruction and keeping the patient comfortable. Theoretically, if an early diagnosis could be made, complete excision might result in a cure. But the early tendency to extension and metastases coupled with the fact that symptoms are late in appearing make this a practical impossibility. Up to the present the disease has resisted all known methods of cure. Analysis of the various operations tried and their results only indicate the hopelessness of this method of treatment. However, it is frequently difficult to be sure that one is dealing with a malignant tumor. Often its consistency suggests a cyst or a non-malignant neoplasm, and as a consequence operation is done without knowledge of its real nature. It would seem that radium had scarcely been given a fair trial. Thus far there are no data upon which to draw conclusions.

TABLE VII—SUMMARY OF CASES

No	Reporter	Age	Duration	Type	Extension	Metastases
1	Imbert (4) 1853	33 y	7 m	Squid cell	Node in the neck to the axilla	
2	Smith (24) 1877	26	5 mo	Rhomboid mesenchyma		
3	Smith (24) 1877	5	2 m	Rhomboid cell	Bladder	Mesenteric gland
4	Scott (24) 1875	8 m	15 wk	Round cell	Bladder and prostate	
5	Koppe (4) 1877	29	5 m	Lymphoma	Bladder	Right suprarenal gland
6	Hughes (4) 1883	35		Rhomboid cell	Bladder	Left ureter
7	Spencer (4) 1883	37	1 y	Rhomboid cell	Rectum	
8	Wright (4) 1883		1 m	Squid cell and spindle cell	Bladder and rectum	
9	Olsen (4) 1883	8	8 mo	Small round cell	Bladder and prostate	
10	Ward (24) 1888	36 y	1 m	Squid cell	Bladder	
11	Stein (4) 1889	4	12 m	Large spindle cell	Rectum	
12	Mithras (4) 1889	7	6 mo	Transitional cell	Bladder and prostate	Retropubic gland and duct
13	Stein (4) 1889	5	4 mo	Sarcoma	Rectal wall bladder	
14	Tedesco (4) 1890	9 m	12 m	Fibrosarcoma with myxomatous degeneration	Ureter	
15	Spencer (4) 1890	63 y	4 m	Mixed	Orbit and prostate	
16	Spencer (4) 1890	5 y	3 wk	Mixed sarcoma	Bladder and ureter	
17	Baugh (4) 1890	17	6 m	Squid cell	Bladder and prostate	
18	Baugh (4) 1890	17	6 m	Squid cell	Bladder and prostate	
19	Gutzler (4) 1895	14 y	35 m	Large spindle cell	Prostate	Left suprarenal gland
20	Mitchell (4) 1896	57	2 1/2 y	Squid cell	Rectum	Ilium
21	Dupe (24) 1896	73	1 y	Small round cell		Shoulder blade
22	Bladston (4) 1897	7 yre		Spindle cell		
23	Verhagen (4) 1898	53	1 y	Mixed	Rectum	
24	Shelton (24) 1899	35 yre	1 mo	Mixed	Bladder and ureter	
25	Levy (4) 1899	45	5 y	Fibromyoma	Prostate	
26	Ehrlich (24) 1902	5 m	11 f	Smooth muscle cell		
27	Ehrlich (4) 1902	3 yre	3 wk	Small round cell	Bladder and prostate	
28	Kaufman (4) 1903	24 y		Lymphoma	Bladder and prostate	Prostate and ureter
29	Berkhardt (24) 1903	50	2 yre	Angiosarcoma	Rectum	

TABLE VII—Continued

No	Reporter	Age	Duration	Type	Extension	Metastases
30	Kaufmann (24) 1902	9 mos	7 wks	Rhabdomyosarcoma		
31	Kaufmann (24) 1902	4 yrs		Rhabdomyosarcoma	Bladder posterior urethra both seminal vesicles	
32	Botesu (3) 1902	2 yrs		Angiosarcoma with myxomatous de generation		
33	Kaufmann (24) 1902	1 ¹ / ₂ yr	22 dys	Round cell with myx omatous degener ation		
34	E Kaufmann (2) 1902	26 yrs	4-5 mos	Rhabdomyosarcoma	Bladder urethra rectum	Liver kidneys stomach and bones
35	Stern (1) 1902	4 yrs	2 dys Post op	Small round cell		
36	Riedel (2) 1903	40	2 ¹ / ₂ mos	Sarcoma	Bladder posterior urethra rec tum	Lungs 3rd rib
37	Kapsammer (24) 1903	40	9 mos	Chondro sarcoma	Posterior urethra	Lungs
38	Levy (24) 1903	4 yrs	2 ¹ / ₂ mos	Myxosarcoma	Bladder posterior urethra perineum	Retroperitoneal glands
39	Vander Hoeven (1) 1903	6 ¹ / ₂ yrs	3 mos	Sarcoma		
40	Riedel (1) 1903	4 yrs	3 mos	Myxosarcoma	Perineum bladder urethra	Kidneys and retroperitoneal gland
41	Gibson (12) 1904	35	Brief	Small round cell	Bladder	No autopsy
42	Bach (1) 1905	34	3 mos	Round cell sarcoma	Right seminal vesicles	Spleen mesocolon thyroid gland
43	Frankel (1) 1906	20 mos	4-5 mos	Spindle cell	Prostatic urethra bladder	
44	Conforti and Fa vento (4) 1907	45	4 mos Post op	Lymphosarcoma	Bladder urethra left ureter	
45	Proutand (Guyon) Van (24) 1907	29	13 mos	Small round type		
46	Grieg (13) 1908	4 yrs		Rhabdomyosarcoma		
47	DePage (6) 1908	5		Small round cell	Regional	On road to recovery so re ported
48	Powers (23) 1908	60	2 mos	Small round cell		No autopsy
49	Wolfgang Veil (1) 1908	45	4-5 mos	Spindle cell sarcoma	Bladder posterior urethra	Lungs retroperitoneal glands
50	Wolfgang Veil (1) 1908	46	3 mos	Spindle cell	Rectum	Liver and kidneys
51	Steinberg (1) 1908	29	4 mo	Round cell sarcoma		Retroperitoneal portal and inguinal glands
52	Eddington (10) 1909	21 mos		Myxosarcoma		
53	Eastman (9) 1909	27	5 yrs	Spindle cell sarcoma		No autopsy
54	Cohen (1) 1909	37	9-10 mos	Round cell sarcoma	Bladder	
55	Arzt u Lannert (1) 1909	40	8 mos	Chondrosarcoma	Posterior urethra	Lungs
56	Menckel (20) 1909	21 yrs	2 mos	Round cell sarcoma	Bladder	No autopsy
57	Bobbeo (2) 1909	28	4 mos	Giant cell sarcoma		

TABLE VII—SUMMARY OF CASES Continued

No	Reporter	Age	D t n	Type	Fat ion	Met at sea
53	Gibson (12) 191	36 yrs	B l	Small round cell	Bladder	No autopsy
59	Paschke (12) 1910	31	11 years after operation	Spindle cell	Bladder	
60	Pinkas (1) 9	50	3 yrs	Leiomyosarcoma		Scrotum, forehead, axilla
61	Pischner (12) 1912	54	3 months after operation in good condition (12 mos)	Spindle cell sarcoma	Regional tissue	
62	Kheter (16) 19	17	8 mos	Mixed cell type round and spindle	Bladder sigmoid	Retracted all lymph glands and lymph glands along thoracic duct, carcinosarcoma
63	Dacosta (7) 1915	14	4 mos	Round cell myxosarcoma		
64	Schell (1) 1916	40	18 mos	Spindle cell	Bladder	
65	Spect (1) 95	47 y	436 mos	Round cell	Bladder	Lungs, kidneys, pleura, mediastinal glands, right bladder
66	Pringle (1) 1917	60	7 m	Spindle cell	Bladder, right abdominal wall, pelvis	Bladder, peritoneum
67	Yag (1) 95	5	245	Mixed cell type	Bladder	No autopsy
68	Nichols (1) 1910	31	36 mos	Round blastoma	Crosthic ethra	No autopsy
69	Newman (1) 99	15	45 m	Round cell sarcoma	Bladder, rectum	Thyroid
70	Shapiro (1) 99		m	Round cell		
71	Quimby (6) 99	4	3 mos	Lymphosarcoma	Pituitary	Brain (?)
72	Herrick (5) 99	33	232 m	Spindle cell	Rectum, bladder	Liver
73	Stewart (7) 9	45	232 s	Spindle cell sarcoma	Bladder	Abdominal wall
74	Tisdell (10) 9	71		Round cell sarcoma		No autopsy
75	Pischner (1) 92	56	1 m	Round cell	Bladder, semicircular ligaments	Kidneys, prostate, liver, spleen, bowels, narrow portal lymph node
76	Pitt (3) 9	8	6 mos	Spindle cell	Bladder	Rectum, abdominal wall, No autopsy
77	Gibber (4) Meyer 93	64	7 m	Spindle cell sarcoma	Bladder	Ureters, kidneys, spleen
78	Morris (8) 93	6	3 m	Round cell sarcoma	Bladder	Ureters
79	Symms (8) 93	30	3 m	Lymphosarcoma		Right pleura, nasal lymph glands, kidneys, liver, left pleura
80	Bennett (1) 93	36	4 1/2	Round cell sarcoma	Bladder	Femur, pelvis, portal lymph glands, kidneys, liver, left suprarenal
81	Tschirner (20) 94	60	436 m	Round and spindle cell		Spleen, lymph glands, pleura, lungs, epistomium, intestines
82	Lentsch (7) 1924	Adult	11 mos	(Spindle cell mixed tumor)		No autopsy
83	Smith and Tager 50 1914	31	6 mo	Rhabdomyosarcoma	Bladder, rectum, ethra	Lungs, right rib, fourth rib, vertebrae
84	Cul (3) 1923	12	6 wk	Larger round cell sarcoma		

as to its efficacy or lack of it. Consequently it might seem advisable to use this agent

PROGNOSIS

At the present time at least, the prognosis is wholly bad. All of the patients in our series have succumbed to the disease. Table VI brings out clearly the fact that the younger the individual, the shorter the duration of life. In this respect sarcoma of the prostate is similar to sarcomata elsewhere.

BIBLIOGRAPHY

- 1 BETTONI. Ueber einen eigenartigen Fall von Sarkom der Prostata. *Ztschr f Urol*, 1923, xvii 1917, pp 106-121.
- 2 BOBBEO. Contributo allo studio dei sarcomi della prostata. *Centralbl f Chir*, 1909 p 651.
- 3 BOTESCU. Primitiv Sarkom der Prostata beim Kinde. *Rev de chir* 1902, No 14, 175.
- 4 CONFORTI and FAVENTO. Sarcoma della prostata. *Folia urolog* 1907, September.
- 5 CULVER. Sarcoma of the prostate. *J Urol*, 1925, xiv, 47.
- 6 DEPAGE. Sarcome volumineux de la prostat. *J de chir*, 1908, pp 372.
- 7 DESCUMS. Report of a case. *Am. J Urol* 1915, ii, 373.
- 8 IDEM. Contribution à l'étude de sarcome de la prostate. Theses de doct. Toulouse 1912.
- 9 EASTMAN. Report of a case. *New York M J*, xc, 1140.
- 10 LIDDINGTON. Myxosarcoma of the prostate in an infant. *Brit M J*, 1909 Sept 18, 754-756.
- 11 EWING. Neoplastic Diseases. 1919 p 767.
- 12 GIBSON. Report of two cases. *J Am. M. Ass*, 1910, April 23, p 1372.
- 13 GREIG. Case of rhabdomyosarcoma of the prostate in a child of four years. *Brit J Child Dis*, 1905, May, pp 185-189.
- 14 GRUBER and MAIER. Trauma und Sarkom der Prostata. *Ztschr f urol Chir*, Berl, 1923 xiii 120-123.
- 15 HERRICK. Sarcoma of the prostate. *Ann Surg*, 1920, lxxi, 168.
- 16 KEHRER. Eengeval van Sarcoma Prostate. *Nederl Tydschr v Geneesk*, Amst 1912, ii 1173.
- 17 LICHTSCHLAG. Ueber Prostata Sarkome. *Beitr z klin Chir*, 1924 cxxx pp 164-66.
- 18 MARIANI. Sarcoma de la prostate en un niño de seis años. *Rev Asoc méd argent*, Buenos Aires, 1923, xxxvi Sect de urol pp 3-7.
- 19 MCFARLAND. Surgical Pathology 1924 p 499.
- 20 MENOCAL. Sarcome de la prostate. *Rev de med y cir de la Habana*, 1909 xiv, 50-64.
- 21 NICHOLSON. Primary sarcoma of the prostate. *Brit M J* 1910 i, 378.
- 22 PARMENTER. Sarcoma of the prostate. *Surg Gynec & Obst*, 1917, xxiv 336.
- 23 POWERS. Primary sarcoma of the prostate. *Ann Surg*, 1908 xlvii 58.
- 24 PROUST and VIAN. La sarcom de la prostat. *Ann d Mal d Org génito urin*, 1907 xxv 721-778.
- 25 PUTZU. Un caso di sarcoma della prostata. *Tumori*, Roma 1922 ix 161.
- 26 QUIMBY. Lymphohlastoma (lymphosarcoma) of the prostate. *J Urol*, 1920, iv 137.
- 27 STEIN and RITTER. Sarcoma of the prostate. *Am J Surg*, 1921 xxv 39.
- 28 SYMMERS. Primary lymphosarcoma of the prostate. *Arch Surg* 1923 vi, 755-763.
- 29 TASCHIRO. Zur Lehre der Sarkome der prostata. *Ztschr f Urol*, 19 4 xviii 321-325.
- 30 TOWNSEND. Sarcoma of the prostate. *Surg Gynec & Obst* 19 2, cxlix 55.
- 31 YOUNG. Case report. *Modern Urol*. Cabot, 1918, vol 1 720.

POSTOPERATIVE HÆMOLYTIC STREPTOCOCCUS WOUND INFECTIONS AND THEIR RELATION TO HÆMOLYTIC STREPTOCOCCUS CARRIERS AMONG THE OPERATING PERSONNEL¹

BY FRANK L. MELFNEY, MD AND FRANKLIN A. STEVENS, MD, NEW YORK CITY
Presbyter Hospital

DURING the spring months of 1935 a number of serious postoperative wound infections occurred in clean cases in the surgical wards of the Presbyterian Hospital. Streptococcus hemolyticus was the organism most frequently found in these lesions. In April and May alone four severe streptococcus infections occurred in 95 clean cases operated upon. This unusual incidence led to an investigation of the origin of these infections. Their virulence indicated a fairly direct transfer from some other human source. They were evenly distributed throughout the surgical wards. They developed in most instances before the first postoperative dressing of the wound. These facts suggested the operating room as the place of contamination. The sterile supplies were found to be innocent. The air of the operating room rarely deposited streptococci on exposed blood agar plates. Greater responsibility was found to rest upon the human factors, the doctors and nurses of the operating staff. A high incidence of streptococcus lesions of all kinds in the surgical wards suggested the probability of a relatively widespread contamination of the doctors and nurses caring for these patients, first of their hands and secondarily of their noses and throats. Cultures of the hands before operation failed to incriminate the technique of "scrub up." A mild epidemic of streptococcus sore throat occurring among the nurses focused our attention on this phase of the problem. During the war Stevens (4) working in Walter Reed Hospital made the observation that the incidence of postoperative streptococcus wound infections ran parallel with the incidence of other streptococcus lesions, particularly affections of the nose and throat. The fact that most of our operators and nurses did not mask the nose during operations was thought to be significant. It was even suggested that a few organisms might pass

through the mask which is made with a double layer of fine gauze to cover the mouth. Cultures were taken from the noses and throats of the operating staff. This revealed the surprising fact that 33 per cent of these individuals were harboring in their throats streptococcus hemolyticus and that one of the instrument nurses carried it in her nose as well.

Just at this time another virulent postoperative wound infection occurred and a hemolytic streptococcus was cultured from it. It was noted that the house surgeon and two of the nurses on the operating team for this case were among those who at the time carried hemolytic streptococci in the throat. One of these was the nurse with the concurrent nose infection. Curiously enough a culture from the patient's own nose and throat also revealed hemolytic streptococci.

We did not believe that the source of all the infections had been discovered but we endeavored to find out whether in this instance the organism in the wound was identical with any of the organisms which we had recovered from the operating staff or from the patient himself. It was planned to attempt the solution of this problem by the application of recently developed methods of agglutination and agglutinin absorption. Because it would require considerable time to work out such a problem the cultures were stored in meat medium in the ice box until the fall. In the meanwhile the operating staff practiced very careful masking of both nose and mouth. Not a single case of postoperative wound infection with the streptococcus hemolyticus has since occurred. (A period of six months.)¹

Two months after this paper was submitted for publication the author learned that the operating room was not masked. It was then suggested that the operating room had been required to be masked since the time the operating room had been required to be masked.

¹From the Department of Surgery, Presbyterian Hospital, New York City. Coll. of Phys. and Surg., Columbia University. Presented at part of the meeting of the Society of Clinical Surgeons, New York City, March 19, 1935 at the Presbyterian Hospital, New York City.

TECHNIQUE

On account of the granular growth of many strains of hemolytic streptococci in broth culture, agglutination with this bacterium has been difficult. By the use of phosphate buffered broth and by transferring cultures several times this spontaneous agglutination may be overcome to some extent. Pieces of sterile potato added to the medium aid in obtaining diffuse growth. If the cultures are centrifuged and the bacteria washed once in distilled water almost uniformly diffuse suspensions are obtained. The density of the bacteria may be varied at will by suspending the washed sediment in the required volume of broth before agglutination.

Unwashed broth cultures were employed in our first agglutination experiments, but in the absorption tests washed potato broth cultures were used according to a previously standardized technique. The technique of the agglutination, the immunization of the rabbits and the preparation of the special culture medium may be found in articles by Stevens and Dochez (5) and by Dochez, Avery, and Lancefield (1). The methods employed in preparing the cultures for absorption and of determining the absorptive dose for each strain were those employed by Stevens and Dochez (6) in their study of erysipelas and scarlet fever streptococci.

EXPERIMENTAL RESULTS AND THEIR DISCUSSION

In the fall a rabbit was immunized against the hemolytic streptococcus strain H W cultured from the infected wound. Almost two months were required to produce agglutinin of sufficient titre. The serum was then tested for agglutination with the hemolytic streptococci obtained from the noses and throats of the operating staff and from the nose and throat of the patient. Unfortunately the strain from the house surgeon's throat failed to survive in the ice box through the summer.)

The strains from the nose and throat of the patient failed to agglutinate with the 'immune' rabbit serum but both of the strains from the nose and throat of the instrument nurse reacted strongly. One other strain was

TABLE I—SHOWING THE AGGLUTINATION REACTION BETWEEN THE "IMMUNE" RABBIT SERUM (1) PRODUCED BY INJECTING THE HÆMOLYTIC STREPTOCOCCUS CULTURED FROM THE INFECTED WOUND (STRAIN H W) TESTED AGAINST THE STRAINS OBTAINED FROM THE PATIENT AND FROM THE OPERATING PERSONNEL

Source	Strain	Serum	Serum Dilutions					
			1/80	1/160	1/320	1/640	1/1280	1/2560
Patient's wound	H W	normal	0	0	0	0	0	0
		H W Immune	4	4	4	3	3	2
Patient's nose	H N	normal	0	±	±	0	0	0
		H W Immune	0	±	±	0	0	0
Patient's throat	H T	normal	0	0	0	0	0	0
		H W Immune	0	0	0	0	0	0
Nurse's nose	S N	normal	0	0	0	0	0	0
		H W Immune	4	4	4	4	4	3
Nurse's throat	S T	normal	0	0	0	0	0	0
		H W Immune	4	4	4	4	4	3
Doctor's throat	T T	normal	0	0	0	0	0	0
		H W Immune	0	0	0	0	0	0
Doctor's throat	U T	normal	0	0	0	0	0	0
		H W Immune	0	0	0	0	0	0
Nurse's throat	V T	normal	0	0	0	0	0	0
		H W Immune	3	3	2	1	1	0
Nurse's throat	W T	normal	0	0	0	0	0	0
		H W Immune	0	0	0	0	0	0
Anæsthetist's throat	A T	normal	0	0	0	0	0	0
		H W Immune	0	0	0	0	0	0

4 represents complete agglutination and the lower figures varying degrees.

(1) The serum used in this experiment was obtained from the first rabbit inoculated with Strain H W.

faintly positive and all of the others were negative. The result of the test is shown in Table I. From this experiment we were able to conclude that of all the strains tested only those from the instrument nurse were biologically similar to the infecting strain. We could be fairly certain that the patient had not infected himself either from without or through his blood stream.

These results narrowed the investigation to a consideration of the closer relationship between the strain from the infected wound and the strains from the instrument nurse's nose and throat. Agglutination alone could

TABLE II—SHOWING THE ABSORPTION OF THE AGGLUTININ IN IMMUNE SERUM H W (I) BY THE HOMOLOGOUS STRAIN H W FROM THE PATIENT'S WOUND AND BY THE HETEROLOGOUS STRAINS S N AND S T FROM THE INSTRUMENT NURSE'S NOSE AND THROAT

Serum	Serum Dilution					
	Strain	$\frac{1}{20}$	$\frac{1}{100}$	$\frac{1}{320}$	$\frac{1}{64}$	$\frac{1}{1280}$
N rmal	H W	0	0	0	0	0
N rmal	S N	0	0	0	0	0
N rmal	S T	0	0	0	0	0
H W Imm ne nhe t d u bsorbed	H W	4	4	4	3	1
H W Immune nhe t d bsorbed	S N	4	4	4	3	1
H W Immune h t i u bs rbed	S T	4	4	4	3	1
H W Immune h at d 56 j min bsorbed	H W	4	4	4	4	3
H W Imm ne h ted 56 j min bsorbed	S N	4	4	4	4	1
H W Imm ne h at d 56 j min bsorbed	S T	4	4	4	4	1
H W Immune bs rbed by Strain H W	H W	0	0	0	0	0
H W Immune bs rbed by Strain S N	H W	0	0	0	0	0
H W Imm ne bs rbed by Strain S N	S N	0	0	0	0	0
H W Imm ne bs rbed by Strain S T	H W	0	0	0	0	0
H W Imm ne bs rbed by Strain S T	S T	0	0	0	0	0

4 pre c is impl agglutinat d the l wee figures \ ry ng d pre s
(1) The rum u d th se perm twa lta d from the 61 stral b i oc lat d w th Strain H W

not establish their identity. It only served to demonstrate certain group relationships. Recently Stevens and Dochez (6) have made some important observations with the streptococci of scarlet fever and erysipelas. They have found that although a high percentage of strains obtained from cases suffering with these diseases agglutinate respectively in scarlet fever and erysipelas antiserum most heterologous scarlet fever or erysipelas strains fail to absorb completely from any given agglutinating serum the agglutinin for the homologous strain. Those occasional strains which do completely absorb the agglutinin from a serum produced by another strain may, when inoculated into rabbits produce a serum which in its turn is not completely absorbed by the other strain. In order to establish the identity of two strains it is necessary to produce an "immune" serum for each strain. Then the strains must reciprocally agglutinate and reciprocally absorb agglutinin. In other words, each strain must agglutinate with both sera and must be capable of completely removing by absorption the agglutinin in the serum produced by the other strain. Krumwiede emphasizes this point (3).

Therefore the next step in the solution of our problem consisted in demonstrating that strains S N and S T cultured respectively from the instrument nurse's nose and throat, having agglutinated in the immune serum produced by strain H W from the infected wound could absorb the agglutinin from this serum. It was found that both of these strains completely absorbed from serum H W the agglutinin both for themselves and for the homologous strain H W. This absorption test is shown in Table II.

The next step required the immunization of a rabbit with either strain S N or strain S T. Inasmuch as these were possibly identical strains coming as they did from the nose and throat of the same individual strain S N, from the nose was chosen for the subsequent test because it was known that the nose of the instrument nurse had been uncovered during the operation, whereas her mouth had been masked. In order to produce sera as parallel in titre as possible, a second rabbit was inoculated with strain H W from the infected wound and a third with strain S N from the instrument nurse's nose. In a month's time the sera had attained a titre

sufficient for the test, though not quite as high a titre as the original H W serum possessed. Preliminary trials revealed the fact that each serum agglutinated both strains to the same degree. It was also found that with the technique referred to above, the strains ran parallel throughout all of the absorption tests. The result of this final test is shown in Table III. It is evident that these two strains fulfill all of the requirements of reciprocal agglutination and reciprocal absorption of agglutinin. One may note also the parallelism of the cross agglutination in the unabsorbed sera. Thus we have shown that strain S N from the instrument nurse's nose is biologically identical with strain H W cultured from the postoperative wound infection.

Morphologically and culturally the strains present the same characteristics. They both ferment dextrose, lactose, saccharose, and mannite, but not salicin. Therefore they fall into a very rare group by Holman's classification, namely, *streptococcus hæmolyticus* I. Holman (2) found this type in only three cases among 1,122 strains examined. Its infrequency lends added interest to the present findings. It is unlikely that *different* strains with these cultural characteristics should be coincident.

We have also demonstrated that organisms are readily deposited on plates from the mouth and nose when no masks are used. An exposed blood agar plate was placed on a table in front of a person who read aloud from a book for half an hour. A control plate was exposed a short distance away to catch the falling air organisms. In every instance, from five to ten times as many colonies appeared on the plate in front of the reader as on the control plate and organisms similar to those cultured by swab from the nose and throat of the individual were recovered from the plates. When the experiment was repeated with the mouth masked and the nose exposed, from three to seven times as many colonies were found as on the control plates. This occurred whether the person spoke or simply breathed over the plate. On the other hand, with both nose and mouth covered with the masks now in use in the operating room, approximately the same number of organisms appeared on the control as on the test plates. We have

observed that when smoke is blown through the nose without undue force by a person standing up, it is propelled some distance below the waist line. It is further well recognized among a number of the members of the surgical staff of this hospital that during ordinary conversation, droplets are frequently expelled from both the nose and the mouth of the speaker. At the end of an operation, an examination of the mask covering the nose reveals black dust particles over areas corresponding to the nasal openings. Thus it is evident that during an operation nose and throat organisms may be discharged upon the sterile field, if the nose or mouth are uncovered. It is altogether unlikely that this is a chance discovery of a rare occurrence. The inference is that other infections with this and with other organisms happen in the same way.

SUMMARY

In April and May of 1925 an unusual number of serious postoperative wound infections occurred in clean cases, from which the hæmolytic streptococcus was recovered. There was a high incidence of general streptococcus infections of all kinds on the wards.

An examination of the operating staff revealed the fact that 33 per cent of these individuals harbored hæmolytic streptococci in their throats and one of the instrument nurses carried it in her nose as well. Most of the operators and nurses were not, at that time, masking the nose during operations.

Directly after the examination had been made, a virulent infection with the hæmolytic streptococcus occurred following a hernia operation. Three members of the operating team for this case were among those harboring the hæmolytic streptococcus, and one of these was the instrument nurse with the concurrent nose infection. The infected patient also carried hæmolytic streptococci in his nose and throat. The serum of a rabbit immunized to the organism cultured from the infected wound strongly agglutinated the strains cultured from the nurse's nose and throat, but did not agglutinate the strains obtained from the patient's nasopharynx nor any of the other strains cultured from the operating personnel except for one strain which reacted weakly.

TABLE III—SHOWING THE FINAL CROSS AGGLUTINATION AND CROSS ABSORPTION TEST WITH NEW SERA¹ IMMUNE TO STRAIN H W (2) FROM THE INFECTED WOUND AND STRAIN S N FROM THE INSTRUMENT NURSE'S NOSE²

Serum	Serum Dilutions					
	Strain	1/80	1/160	1/320	1/640	1/1280
Normal	H W	0	0	0	0	0
Normal	S N	0	0	0	0	0
H W Imm u heated un absorbed	H W	4	4	3	2	0
H W Imm e heated un absorbed	S N	4	4	2	2	0
S N Imm e heated un absorbed	H W	4	4	3	2	0
S N Imm e heated absorbed	S N	4	4	2	2	0
H W Imm heated 30 min unabsorbed	H W	4	4	2	2	0
H W Imm heated 30 min unabsorbed	S N	4	3	2	2	0
S N Imm heated 30 min unabsorbed	H W	4	4	2	2	0
S N Imm heated 30 min unabsorbed	S N	4	4	2	2	0
H W Immu absorbed by St n H W	H W	0	0	0	0	0
H W Immu absorbed by St n H W	S N	0	0	0	0	0
H W Immu absorbed by St n S N	H W	0	0	0	0	0
H W Immu absorbed by St n	S N	0	0	0	0	0
S N Imm e absorbed by St n H W	H W	0	0	0	0	0
S N Imm e absorbed by St n	S N	0	0	0	0	0
S N Imm absorbed by St S N	H W	0	0	0	0	0
S N Imm absorbed by St S N	S N	0	0	0	0	0

4 pe H W mlt gel to nltel e figure vary ed at
(Th H W e m ed th e p m tw obtai lfr mth e
Th dln th eashigh aggl i gtreasth first H W Immu r aboutth yran pass l w th chether i H fthe lats

The serum of a rabbit immunized to the organism recovered from the nose of the nurse agglutinated in its turn the strain from the infected wound and each strain completely absorbed from the serum produced by the other strain the agglutinin both for itself and for the homologous strain.

Culturally the strains were in every way similar and belonged to a rare group according to their sugar fermentation reactions.

Organisms are discharged from the unmasked nose and mouth of individuals during speaking and from the nose during expiration.

The evidence is very strong that one of our cases of postoperative hemolytic streptococcus wound infection was caused by the transfer of the organism from the nose of the instrument nurse to the wound at the time of operation.

CONCLUSIONS

1 Postoperative wound infections in clean cases may be produced by organisms expelled

from the nose or mouth of operators, nurses, or visitors.

2 All persons who may in any way come in proximity to the sterile field during an operation should mask very carefully both the nose and the mouth.

NOTE—A brief review of some of the theoretical considerations of the phenomenon of agglutination as applied to this group of experiments will be sent to any one who may indicate his interest in that feature of this problem.

BIBLIOGRAPHY

- 1 DOCHTZ A R, WERY D T and LANCEFIELD R C J Exper Med 1919 xiv 179-213
- 2 HOLMAN W L The classification of streptococci J M Re cach 1916 xxvii 377-443
- 3 KRUHWEID C, COOPER G and IROVOST D J Agglutination absorption J Immunol 1925 x 55-239
- 4 STEVENS I A Report of the medical department of the United States Army in the World War 1924 Vol vi part II 261-264
- 5 STEVENS I A and DOCHTZ A R J Exper Med 1924 vi 253-262
- 6 STEVENS I A and DOCHTZ A R J Exper Med 1926 xlii 319-393

CLINICAL SURGERY

FROM THE SURGICAL SERVICE, ST STEPHEN'S HOSPITAL, BUDAPEST

TECHNIQUE OF OPERATIONS FOR CARCINOMA OF THE BUCCAL MUCOUS MEMBRANE¹

BY PROFESSOR DR EUGENE PÓLYA, BUDAPEST HUNGARY
Chief Surgeon to St Stephen's Hospital

THE greatest danger in performing all such operations is that there is the possibility of recurrence. Cancer of the buccal mucous membrane is malignant, generally more malignant than cancer of the lower lip but less malignant than carcinoma of the tongue. That cancer of the buccal mucous membrane is so malignant is due to the fact that there is apt to be an early involvement of the regional lymph nodes and consequently local recurrence. The anatomical course of the lymph vessels that drain the buccal mucous membrane and other surrounding structures, such as the lips, the gums, and the skin, is a definite handicap in a radical removal of the carcinoma.

The lymphatics of the buccal mucous membrane as a rule drain into the submaxillary lymph nodes, exceptionally an occasional lymph vessel may drain into glands situated in the substance of the parotid or into the upper superficial cervical group that lies at the lower margin of the parotid gland, close to the mandibular angle. The lymphatics of the lower gums enter the submaxillary and submental lymph nodes. The lymphatics of the upper gums accompany mostly those of the buccal mucous membrane to the submaxillary group. A few, however, drain together with lymphatics of the palate into the upper deep cervical lymph glands. The lymph vessels of the palate arches and of the tonsils go to the upper deep cervical group. The lymph vessels of the skin of the cheek drain into the submental parotid, superficial cervical and submaxillary lymph glands, some lymphatics may empty into the contralateral submaxillary lymph glands or into the deep upper cervical group on either side. The lip sends lymphatics into the submental and submaxillary region, sometimes, also, to the deep cervical lymph nodes. Both the submaxillary and the deep cervical lymph glands can be involved on both sides in a one sided lesion. In the course of the lymphatics

that originate in the cheek, smaller lymph nodes are often interposed. These lie on the mandible or on the buccinator muscle. The lymphatics of the buccal mucous membrane run mostly in the fascia of the buccinator muscle, some of them are covered by the buccopharyngeal fascia. Lower down all lymphatics are in close relationship to the periosteum of the mandible, that is, they either lie just above or in the periosteum itself. As the buccinator muscle and also the mandibular periosteum are involved comparatively early, the carcinoma may break into the lymphatics at these points and can progress by continuity. The efferent vessels of the parotid and upper superficial cervical lymph nodes continue their course to the upper deep cervical group of the same side, while the submaxillary and submental groups drain into the deep cervical glands on both sides.²

It is then justifiable to assume that cancers which are definitely limited to the buccal mucous membrane will involve only the submaxillary and upper deep cervical lymph glands on the same side. The more the tumor involves the neighboring structures the more one should investigate distant groups of lymph glands, such as the deep cervical and submaxillary groups on the other side, as well as the submental, supraclavicular and other lymph glands.

Radical treatment of buccal cancer requires, then, not only extensive local excision, but also the removal of the diseased lymphatic groups. Only in the presence of very small and well localized carcinomata that can be removed through the mouth and do not require any plastic operation and in which clinical signs of lymphatic involvement are absent would I refrain from removing the regional lymph nodes. In every other instance, at least the submaxillary and the upper deep cervical lymph nodes of the same side should

¹Detailed description in Pólya and von Navrátil: Lymph vessels of the buccal mucous membrane. *Deutsche Ztschr f Chir* 1902 xlvii.

²Translated by Geza de Takats M D

be removed *in toto*. This principle can be adhered to the more readily because the additional incisions that are necessary to cover the defect expose these regions anyway. Further groups of lymph glands should be excised only if their involvement is evident. Otherwise one should rather be conservative about removal, but should keep the patient under close observation and at the first sign of a recurrence in the lymphatics, these glands should be removed. A too radical primary extirpation of distant lymph nodes that are seldom involved should not be systematically adopted for the chances of primary healing are then diminished and, besides a rapid general metastasis may follow the extensive removal of the physiological barricades. On the other hand the clinically diseased lymph nodes and chiefly the primary tumor should be thoroughly excised. The excision should extend into the normal tissue far away from the diseased tissue. One should not try to be too conservative. The use of cautery undoubtedly makes the operation more radical yet when plastic procedures are contemplated it is better to use sharp dissection with scalpel and scissors.

The removal of buccal mucous membrane will be followed by scar formation. If this becomes too extensive the contraction will inhibit the opening of the mouth. Therefore larger defects of the mucosa should be repaired by a plastic operation. Otherwise the cicatricial contraction will disturb more or less extensively mastication and the speech of the patient. To prevent this an adequate plastic substitution of the mucous membrane should always be made.

The patient's condition is still worse if the cancer involves the skin of the cheek which is very often the case. After the growth is removed a smaller or larger defect remains in the cheek which absolutely requires closure not only for cosmetic reasons but in order to insure the normal nutrition of the patient and to prevent a constant outflow of saliva. In every case in which a more or less extensive excision has been done for buccal carcinoma it is necessary to do a plastic operation to replace the mucous membrane and buccal skin according to the demands of the case in question. I feel that the plastic operation should be done if possible in one stage immediately following the excision. I realize the great advantages of tubed flaps and multiple stage operations in benign lesions such as defects after injuries or noma but in malignant growths where the danger of recurrence is imminent the period of healing should be as short as possible. Procedures which take several months or at least many weeks to com-



Fig. 1 Line of incision for smaller growths

plete should be abandoned for methods that accomplish healing in 1 to 2 weeks. Also the conditions for plastic operations so far as the wound is concerned are most favorable immediately after the excision.

The immediate dangers of the removal of buccal carcinoma such as bleeding and shock are not to be estimated too high if suitable methods are used; however there is a danger of post-operative pneumonia because the oral cavity and pharynx of these patients are badly infected with a putrid secretion from the broken down carcinoma. Furthermore the act of swallowing and spitting is hindered after the operation partly for purely mechanical reasons and partly because these functions are extremely painful. General anesthesia therefore should always be avoided and local anesthesia used.

PREPARATION OF THE PATIENT

It is most important to prepare the oral cavity, remove bad teeth, roots and tartar yet this should not be done immediately before the operation but some days beforehand. If the cleansing cannot be thoroughly done without disturbing the carcinomatous area it is better to let it go entirely. In spite of bad roots and tartar the wounds heal surprisingly well in the oral cavity. If the carcinoma has spread to the bone and the teeth are encircled in the cancerous region, they should be removed during the operation. Altogether the production of wound surfaces in the presence of a carcinoma in the mouth is not without danger because of the possibility of implantation. Therefore if the cleansing of the mouth can be accomplished only by extensive injuries to the mucosa it is wiser to restrict oneself to rinsing with hydrogen peroxide or any other harmless mouth disinfectant.

The face and neck of the patient must be totally shaved, sometimes even above the hairline, if a



Fig 1



Fig 3

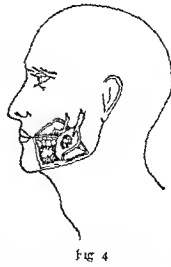


Fig 4

Fig 1 Line of incision used in approaching larger defects

Fig 3 The flap is dissected from its base and is immediately pulled upward by means of sharp retractors

Fig 4 The posterior attachments of the ulcer are the last to be removed

Fig 5 The flap is attached to periosteum of mandible for a distance of 1 to 1.5 centimeters

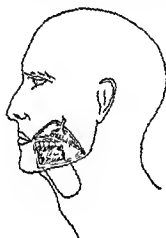


Fig 5

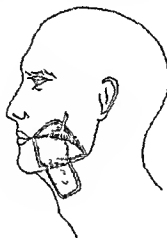


Fig 6



Fig 7

Fig 5 Gersury flap outlined. The flap is attached to periosteum of mandible for a distance of 1 to 1.5 centimeters

Fig 6 Flap is turned into oral cavity and its edges are sutured to edges of defect, preferably from the inside

Fig 7 The flap is sutured in place and a drain inserted

larger defect of the skin has to be substituted by skin from the skull. A good dose of morphine subcutaneously half an hour before the operation is indispensable. One half to one gram of veronal 1 to 2 hours before is helpful. In the operating room the skin is rubbed with ether, then a weak tincture of iodine (4 to 5 per cent) is applied. The mouth is not disinfected or rinsed just before the operation.

TECHNIQUE OF OPERATION

SELECTION OF METHOD

An exact plan should be made not only as to the removal of the growth but also regarding the plastic operation which follows. The latter will also influence the method of anesthesia, which

must be extended beyond the field of operation. In order to construct a plan, the size, situation, relationships of the growth, and the extent of lymphatic involvement have to be considered.

Small cancers that are limited to a circumscribed area of the mucous membrane are easy to handle. In such cases, no plastic is required and they can be attacked through the mouth. A slight involvement of the gingiva does not contraindicate this approach. In such cases the lymph glands should rather be removed 1 to 2 weeks later. In very early cases, if the patient can be kept constantly under control, the removal of lymph glands may be dispensed with and done only at a later period when their involvement is clinically manifest or at least suspected. The appearance of a locked jaw is much

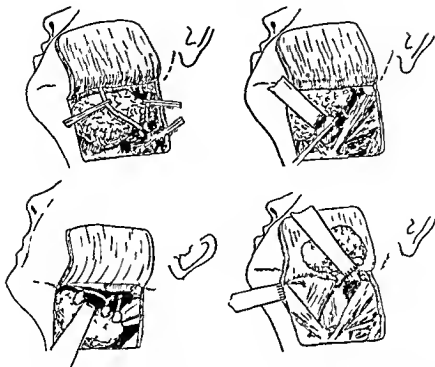


Fig 8 (left above) Exposure of facial vein as it crosses muscle and salivary gland

Fig 9 (right above) The external maxillary artery is pulled forward with forceps and cut between two ligatures

Fig 10 (left below) Dissection of fascia and fat reveals the three constant lymph nodes

Fig 11 (right below) Final steps in cleaning out submaxillary region

less to be feared in carcinomata lying anteriorly close to the angle of the mouth than in tumors in the posterior part of the vestibulum close to the ascending portion of the mandible. Here opposite

the last lower molar is a favorite site of these tumors. Patients with well developed muscles of mastication press the mucosa against this tooth and one often sees in men, who neglect a regular

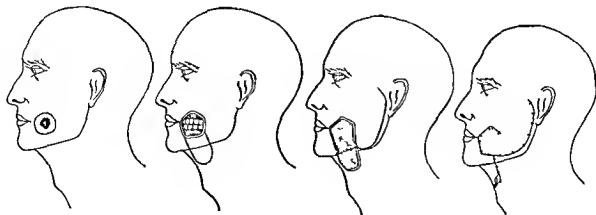


Fig 12

Fig 13

Fig 14

Fig 15

Fig 12 Line of incision

Fig 13 A Gersuny flap is formed in submaxillary region

Fig 14 Incision extended to zygomatic arch

Fig 15 Operation completed and drainage applied

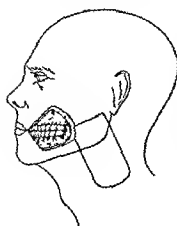


Fig 16



Fig 17



Fig 18

Figs 16 to 18 Procedure used when there is extensive skin involvement

mouth cleansing an impression of the last molar in the mucous membrane. At this point any defect larger than a nickel may cause later a locked jaw, whereas close to the angle of the mouth defects of the size of a half dollar may heal without any particular disturbance.

ANÆSTHESIA

Local anæsthesia should always be used. Morphine and veronal are given previously. As a local anæsthetic 1 per cent novocain with the addition of adrenalin is used for local infiltration and field block. In major procedures, especially when the bone has to be attacked, a block of the second and third trigeminal branch is produced.

To anæsthetize the second branch, Payr's method is usually followed. A dermal wheal is made at the angle of the frontal and temporal processes

of the zygoma, one finger's width behind the lateral orbital margin. The needle is inserted here horizontally and pushed ahead just above the upper margin of the zygomatic arch until it reaches the maxillary tuberosity, at a depth of 3 to 3.5 centimeters. The needle slips easily from here into the pterygoid fossa. Here at a distance of about 1 centimeter from the tuberosity of the maxilla, 5 cubic centimeters of the novocain solution are injected.

The block of the third branch is done according to Braun's technique. The wheal is made just in the middle of the lower margin of the zygomatic arch, and the needle carried forward in a transverse direction until in 4 to 5 centimeters depth the pterygoid process is felt. This distance is marked on the needle, which is now retracted back to the subcutaneous tissue and inserted again 1



Fig 19



Fig 20



Fig 21



Fig 22

Figs 19 to 22 Procedure used when there are large defects of the cheek.

Fig 19 Line of incision

Fig 20 Shows flap outlined

Fig 21 Mobilization of flap attached only by temporal vessels

Fig 22 If a secondary defect occurs it is covered with Thiersch grafts



Fig. 3 Result in patient after removal of small carcinoma



Fig. 24 Result after operation for growth involving muscles and retromaxillary region



Fig. 25 Result after operation for growth involving muscles

centimeter farther back and carried to the same depth or even a little deeper. Five cubic centimeters of novocain are here deposited.

However if there is a danger of puncturing carcinomatous tissue with this injection which may mean implantation of carcinoma cells or severe infection and even meningitis it is better to apply the puncture farther back in the semilunar incisura of the mandible between capitulum and coronoid process of this bone and to deposit the solution around the trunk of the mandibular nerve at the foramen ovale. The inferior alveolar and lingual nerves are blocked in the interpterygoid triangle. For the former block the injection is made in a transverse direction with the mouth open just below the articular tubercle. At a depth of 4 to 5 centimeters the needle will come in contact with the bone. The needle is now pulled slightly back and 5 to 6 cubic centimeters of novocain are deposited. The optimal effect of the nerve block presents itself in about 10 minutes.

A SMALL CANCERS CLOSE TO ANGLE OF MOUTH

These tumors are of the size of a quarter and lie just behind the angle of the mouth. They involve only the mucous membrane, do not penetrate, are freely movable and do not adhere to the skin. Cancers lying in the angle itself and involving the lips are not discussed here and must be operated on in a different manner.

Patient is placed in a half sitting position on the operating table. The region around and under the growth is infiltrated with the anæsthetic. It is best to insert the needle in the skin at the angle of the mouth. The mouth is opened, an assistant stands behind the head of the patient and retracts both lips with the index fingers, pressing the tumor forward with the thumb. The ulcer is cir-

cumscribed with the cautery about 1 centimeter away from its margin into the normal tissue. The cautery then penetrates into the tissue, the freed margin is picked up with a forceps and the tumor separated from its base. Generally there is no bleeding at all. If bleeding occurs, the cautery is pressed on the bleeders. After hæmostasis has been established a strip of iodoform gauze is applied on the wound, its end hanging out at the angle of the mouth. However, this is not essential.

B SMALL CARCINOMA AT SITE OF PREDILECTION

Such grow this not larger than the size of a penny even if they involve the gingiva to a slight extent may be approached through the mouth and burned out with the cautery as described under A, provided the mouth can be opened satisfactorily. However it is safer to enlarge the orifice by an angular incision which is formed by an incision made in the nasolabial fold and a horizontal line from this fold to the corner of the mouth. I advised this method instead of the transverse incision of the cheek¹ because it gives a better exposure and the resulting scar is almost invisible in a few weeks even in women and beardless men. The transverse incision often leaves a deep bound down scar which is especially conspicuous if the face becomes œdematous after the operation as is often the case.

The patient is placed in a half sitting position. A dermal wheal is made in the region of the angle of the mouth and from this point the nasolabial fold and the whole cheek is infiltrated. If there is gingival involvement the third branch of the trigeminal nerve must also be blocked.

An incision is made in the nasolabial fold down to the level of the corner of the mouth, and a

¹ *Zentralbl. f. Chir.* 1910 No. 6



Fig 6



Fig 7



Fig 28

Fig 26 Large defect of cheek

Fig 7 Large defect of cheek

Fig 28 Result in case with large defect of cheek. Mandible has also been removed

transverse incision connects the lower end of this incision with the angle of the mouth (Fig 1). The transverse part of this incision is made through all layers, the oblique part is only carried through the skin, subcutaneous tissue, and superficial muscles. If this does not provide enough room, all layers, including the mucous membrane, can be separated. The transverse incision is continued but only in the mucous membrane to about 1 centimeter from the carcinomatous ulcer; the opening of the Stenon's duct is preserved above the incision. The cut margins are pulled apart somewhat undermined and a semicircular blunt ecarteur inserted. The ulcer is circumscribed and dissected from its base with a cautery as described under A.

If the ulcer has invaded the gingiva, the teeth in this region should be extracted, the gums and periosteum lifted and pushed aside with an elevator. The alveolar processes are chipped off with a Luer forceps. The resulting wound surface must be thoroughly cauterized.

After a complete hemostasis has been established, which if necessary at all is made with the cautery, a strip of iodoform gauze is applied on the wound surface.

The mucosa is sutured with catgut and the skin with finest silk. If the muscle has been cut in the nasolabial fold, it is united with a few catgut sutures.

C. CARCINOMA OF UPPER OR LOWER BUCCOGINGIVAL REFLECTIONS OF MUCOUS MEMBRANE

The method described under B also can be applied in cases in which the carcinoma is situated in the upper or lower buccogingival reflections of

the mucous membrane. The tumor may originate in the buccal mucosa and involve the gingiva, or vice versa, provided not more than one third of the mucous membrane is involved, so that after the excision with the cautery at least one half of the mucosa is available. If the cancer invades the gingiva or the floor of the mouth, it can also be approached in this manner. Here again, teeth should be extracted at least 1 to 1.5 centimeters in front and behind the tumor, the periosteum is removed even if it is apparently normal, and the alveolar processes are bitten off. The cautery is again applied on the resulting wound surface.

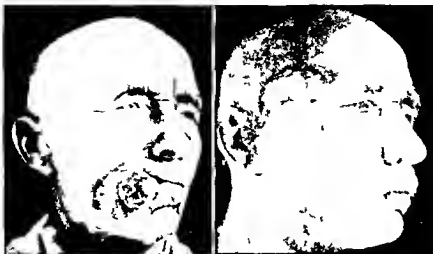
The slightest involvement of the musculature of the cheek or of the skin is a contra indication to this method and requires a plastic procedure.

D. LARGER TUMORS INVOLVING MUSCLES OR RETROMAXILLARY REGION

In this group we have patients whose tumors are larger than those described under A, B, and C, or in whom the muscles are involved, or the retromaxillary region invaded. In the latter case, the cancer lies in the posterior corner of the buccal pouch and manifests itself in a restricted opening of the mouth. However, the skin is still intact.

In these cases the removal of the mucous membrane, together with other infiltrated structures, should be as extensive as possible and should be followed by a plastic operation. The skin of the face should be entirely free from cancer, freely movable, and one should be able to pick it up in folds.

For operation, the patient is placed in a half-sitting position with the head bent backward, and a small bolster placed under the shoulders. The



Figs. 29 and 30 Before and after operation in patient with extensive defect of skin



Fig. 31 Extensive skin involvement

patient lies on the back and his head is turned toward the normal side. The anæsthetic is injected into the second and third branches of the trigeminal; the local field is blocked, and the cheek and submaxillary region are infiltrated.

An angular incision starting from the angle of the mouth extends straight downward and is continued in a transverse line running parallel and 1 centimeter above the mandible as far as the angle of the mandible (Fig. 2). The flap is dissected up from its base and pulled upward with sharp retractors (Fig. 3). Now the mucous membrane is incised and is removed with scissors and forceps for a distance of possibly 1.5 centimeters away from the carcinomatous ulcer. The more normal tissue that is removed the better. At all events the mucosa should be removed downward to the reflection on the gingiva upward if the upper gingiva is quite intact; it is a good plan to leave a margin of a half centimeter; if however the growth reaches up to the upper gums or even infiltrates them this advantage can by no means be considered.

In cases in which tumor invades the gums, the corresponding teeth as mentioned above should be extracted. They are usually loose. Gums with periosteum are pushed back; the alveolar processes clipped off, and the whole surface cauterized.

Together with the mucosa the whole musculature of the cheek should be removed. Also the fat layer of Bichat, which can be pulled out easily, should be included. The external maxillary artery and the anterior facial vein enter the soft parts of the cheek at the anterior border of the masseter muscle and should be here tied and cut.

The removal of the soft parts of the cheek is best started in the front; then the tissues are cut below and above. If necessary gums and alveolar processes are disposed of in the way described. In this manner the posterior attachments of the ulcer are the last to be removed (Fig. 4) so that one can cut them under visual control and remove as much as possible of the fat in the interpterygoid region. During this last step a branch of the internal maxillary artery or the artery itself may be injured so that it is an advantage to see clearly and to have the whole oral cavity cleaned out in order to catch and tie this vessel.

After the growth is removed the wound surface of the mouth is covered with gauze and the operator changes gloves.

Next the defect of the mucosa must be corrected. In cases in which the skin of the submaxillary region is intact this can be done according to Gersuny's method. The region is painted once more with a weak iodine solution. Corresponding to the size of the defect a flap is outlined (Fig. 5), which remains in contact with the periosteum of the mandible only for a distance of 1 to 1.5 centimeters. The flap should be as wide as the defect and sufficiently long so that when the mouth is opened the point of the flap reaches up to the upper end of the defect without tension. The upper margin is formed by the lower margin of the transverse incision, which has been made to form the flap. From here two parallel incisions are made downward at a right angle, and the lower margin of the flap is well rounded out. It is best to undermine this flap together with the platysma, up to the lower margin of the mandible.

The connection with the mandibular margin must be carefully protected, as this narrow bridge insures the nutrition of the flap.

Through this undermining, the submaxillary region is well exposed and gives us opportunity to remove the lymph glands. It is best to remove all the lymph glands together with the submaxillary gland and fat in one mass, so that a clear anatomical picture of the musculature is ultimately obtained. There are usually three lymph nodes here but there may be more.

The dissection is started at the posterior border by exposing the posterior margin of the submaxillary gland. This is generally covered by the posterior portion of the digastric muscle. The common facial vein appears at this point crossing over the muscle and the salivary gland. It should be dissected out (Fig. 8) and cut between two ligatures. This vein is now followed along its tributaries, the anterior and posterior facial veins, whereby one or more accessory lymph nodes are encountered. The posterior vein is followed in its course to the lower pole of the parotid gland and here divided between two ligatures. Lymph nodes found here are excised. The return now to the posterior border of the submaxillary gland which is lifted up, whereby the posterior portion of the digastric muscle is exposed. We now dissect down along the border of this muscle. In lifting up the submaxillary gland, the external maxillary artery, which enters this region from behind the posterior part of the digastric muscle is put on a stretch, pulled forward with a forceps (Fig. 9), and cut between two ligatures. A small branch tending upward is often visible. This ascending palatine artery is also clamped and tied as it may give rise to considerable hæmorrhage. After the two main vessels are cut, the posterior part of the submaxillary gland can be lifted out entirely from its bed. Now the anterior portion of the digastric muscle is freed from fascia and fat, during which a few superficial veins may be encountered. Next the upper border of the gland is exposed and we see the three constant lymph nodes between submaxillary gland and mandible (Fig. 10). The surgeon penetrates into the space between these two structures and lifts out the group of lymph nodes with the upper border of the submaxillary gland. The tied stumps of the facial vessels are hereby pulled out too. Sometimes a few smaller veins must be tied. The foremost member in the lymphatic chain lies in the niche between the mylohyoid muscle, the anterior portion of digastric and mandible. Here the submental artery must be clamped, as this artery communicates with the same artery from the

other side and may give rise to disagreeable bleeding. Now the whole group of lymph nodes, together with the submaxillary gland, is freed and hangs only on a narrow process of the salivary gland which, together with the Wharton's duct, leaves this region behind the border of the mylohyoid muscle. This is clamped, tied (Fig. 11), and cut. This completes the cleaning out of the submaxillary region. Its whole content is removed *in toto*.

Now the deep upper cervical lymph nodes should be inspected. The anterior border of the sternocleidomastoid muscle is retracted, the fascia behind the posterior portion of the digastric is excised. Thus the lymph glands lying on the internal jugular vein are exposed. They are removed in such a way that the vein is bluntly exposed with a small sponge and the lymph glands with adjoining fat are pushed off. Small vessels which enter the lymph glands are clamped and tied with finest catgut. Care must be taken not to injure the internal jugular vein and the accessory nerve which runs amid these lymph glands.

The wound on the neck is well covered with sponges and we return to the flap. This hangs as described above on the outer surface of the mandible on a narrow base. To mobilize the flap better in order that it may be turned into the mouth satisfactorily, it is advisable to incise the periosteum about 1 centimeter above the mandibular margin on the inner surface and to lift it up as far as the external border. The gauze packs are now removed from the mouth, the patient is asked to open the mouth and the flap is turned into the oral cavity, its margins being sewed to the margins of the defect (Fig. 6). I prefer to suture from the inside always using catgut for the mucosa. The suture from the inside is facilitated if the surgeon changes places and goes over to the normal side of the patient. One begins with suturing the posterior margin of the flap to the posterior border of the defect in the mucosa. No sutures are placed below, as this might endanger the nutrient base of the flap. Therefore, when the posterior margin is completed, the lower border of the flap is united with the mucous margin on the upper gums if any such margin is present. If not, the subcutaneous tissue of the flap is sutured to the periosteum and musculature of the upper jaw with a few catgut sutures, which are tied from the outside and not from the oral cavity. Very exact union must be made between anterior margin of the flap and anterior border of the defect, which is the margin of upper and lower lips. It is wise to unite the cut edges of mucous membrane on the

upper and lower lip first so as to form a satisfactory angle of the mouth

Gloves are now changed again. The cervical wound is revised and a drain with the point under the mandible inserted (Fig 7). The skin is closed in the direction from below upward. It may be necessary to lengthen the originally transverse incision in front and behind and to mobilize the resulting quadrangular flap in order to get a suture line without tension. This is very important because a sure and safe covering of the reflected flap should be accomplished. If this is not the case, disagreeable fistulae may develop through which saliva or even food particles may be discharged.

Next the facial flap is turned down and sutured into place. The suture material should be very fine but resistant silk.

E. CARCINOMA WITH SKIN INVOLVEMENT

If the carcinoma has also involved the skin this must be excised extensively in normal tissue and the defect covered. A plastic of the skin of the cheek alone is just as inadvisable as a substitution of the mucosa without cutaneous covering. In both instances one can count on a marked contraction of the uncovered surface. If the defect of the mucosa is not attended to a locked jaw will result, not covering the skin will result in a cosmetic failure. Thiersch grafts are just as ineffective. The slightest marginal necrosis, or the cutting through of a suture, will result in a fistula which requires a reoperation and union may not be secured. It is therefore important in cases of such defects to close both skin and mucosa in a reliable manner.

If the loss of skin is not too extensive a reconstruction from the face itself is usually feasible.

The procedure is similar to that described under D except that instead of beginning with a rectangular incision which forms the facial flap one begins with the excision of the carcinomatous skin or with the skin still intact which is bound down to the underlying tumor (Fig 12). This carcinomatous area if it is not too large, should be excised in round or oval form. In case the angle of the mouth does not need to be excised a transverse incision connects the angle with the anterior margin of the excision. First the carcinoma is extirpated from the mouth as described under D. Now the extent of the defect is measured and if suitable, a Gersuny flap is formed in the submaxillary region (Fig 13). The submaxillary region and the upper deep cervical lymph nodes are removed and Gersuny's flap as shown under D is sutured into the defect of the mucosa. To

cover the skin defect an incision is carried along the margin of the mandible which turns upward at the angle of the jaw and reaches the level of the zygomatic arch before the ear (Fig 14). Through this incision the entire skin of the face up to the orbit and zygomatic arch is mobilized. Now the skin can be easily drawn forward into the defect (Fig 15), the margins being united with fine silk. Secondary defects do not remain as a rule, especially if at the periphery of the wound a few sutures are made in the radial direction.

Figure 25 shows a case operated on in this manner.

F. CASES WITH EXTENSIVE SKIN DEFECT

If the defect of the skin is extensive or even involves the submaxillary region the flap can be outlined in such a manner that some more skin is taken from the temporal region. The incision described under E is continued upward before the ear toward the temple then turned back with a curve and carried down to the region of the upper orbital margin (Fig 17). This results in a large flap the base of which is in the zygomatic region. After adequate mobilization the defect can be covered very nicely (Fig 18). A secondary defect may sometimes ensue in the temporal region and is covered by a Thiersch graft.

G. LARGE DEFECTS OF THE CHEEK

For very large defects of the cheek, great flaps from the hairy portion of the skull are the best. These are made according to Esser with nothing but the temporal artery as a nutritional stem. An incision is made before the ear straight upward as high as the lower margin of the flap is planned. The flap is mapped out in quadrangular or circular form so as to fit into the defect (Fig 19) and the temporal artery with the concomitant vein is dissected clear out of the surrounding fatty tissue, great care being taken not to injure the vessels. Special care must be exercised at the origin of branches which must be well isolated and tied and at the lower margin of the flap where the vessels enter. Only after a complete isolation of the temporal artery and vein should one cut out the flap. The incision should penetrate down to the temporal fascia or to the bone and it is best to pull down the skin flap from above the flap hanging only on the narrow stem of the temporal vessels (Fig 21). If the defect in the skin reaches laterally to the preauricular incision, then the whole flap with the artery after a satisfactory twist, is laid into the defect. However if a strip of normal skin lies between the defect and the incision which exposed the tem-

poral artery, then one can connect the two by a horizontal incision into which the temporal vessels are laid, or the skin can be undermined and the flap pushed through subcutaneously. All wounds on the face are united with finest silk. The secondary defect in the temple is covered with a Thiersch graft (Fig 22). Figures 26 to 28 show the result in three such cases, in Figure 28 the right half of the mandible has been removed.

H GROWTHS INVOLVING THE MUCOSA

The flap of Gersuny which we take from the submaxillary region to cover a defect of the mucosa after an excision for buccal carcinomata, some times can not be used. This is true in recurrences, in which the submaxillary lymph glands have previously been removed, in the presence of scar of some other origin which makes the submaxillary skin unavailable or finally in cases in which the carcinoma has involved the periosteum or the mandibular bone itself, so that the periosteal flap cannot be used to supply the skin with blood. In such cases the mucosa is best supplemented by a skin flap from the masseteric and parotid region, the basis of the flap being the masseter muscle. I originally advocated these flaps to cover defects in the pharyngeal wall, but they also do well as substitutes for buccal mucosa. In cases in which the whole lower jaw has to be removed, this masseteric flap is equally useful although in some cases a lingual flap will be sufficient.

In forming a masseteric flap a piece of skin is excised, the upper margin of which corresponds approximately to the middle of the masseter muscle, the lower margin extending more or less distant from the mandibular margin in the cervical region. It is two and a half to three fingers wide. This flap is circumscribed entirely (Figs 16 and 20) and dissected up from its base on the neck, but left in connection with the masseter muscle. The border of the muscle is exposed at the lower margin of the mandible and the masseter, together with the periosteum is pushed off from the bone whereby the flap is mobilized and may be turned in with its epithelial surface toward the oral cavity (Figs 17 and 21) and fixed there with catgut sutures. These sutures are best tied from the inside. As a larger skin defect is usually present, this flap is covered at the same time with a skin flap, as described under F and G.

In case the lower jaw is removed, the defect of the mucosa may be substituted by the mucous membrane of the floor of the mouth or of the tongue. The incision in the floor of the mouth constitutes the free margin of the flap. Two parallel incisions, which are carried at a right

angle to the longitudinal axis of the tongue circumscribe this flap, which is turned down to a thickness of approximately 2 to 3 millimeters into the defect and sutured to the edges of the lips, upper gums, and palatine arch.

A bone involvement may occur in the early stages of buccal carcinoma. Therefore, as mentioned several times, if the tumor has reached the gums, the alveolar processes should be chipped off and the teeth in that region extracted even if there is no macroscopic involvement. The wound surface is cauterized. However if the alveolar process is manifestly involved, the body of the mandible should be bitten out with Luer forceps or with the chisel all around the alveolus, but still maintaining the continuity of the bone at the lower margin. If the carcinoma has destroyed the body of the lower jaw, it is wise to remove the corresponding whole side of the mandible. This procedure is also indicated, when the growth has reached the groove between the alveolar process and the ascending portion of the jaw. In tumors of typical location at the posterior angle of the buccal pouch this occurs quite often. When the opening of the mouth is restricted, this pathology may be anticipated. Carcinomatous lymph glands may adhere or break into the bone. At any rate it is advisable to visualize with an X-ray picture how serious is the involvement of the mandible. The X-ray will not only facilitate an adequate orthodontic preparation of the patient with an immediate prosthesis but also helps to establish the plan of operation. The upper jaw is more seldom involved than the lower jaw. A partial removal of the bone in the first case can be more easily made without endangering the thoroughness of the operation. At this point we wish to mention only the technically important points in a one sided enucleation of the mandible for buccal carcinoma.

If the enucleation of the mandible has been decided upon previous to the operation, then the bone has to be removed in one piece with the buccal carcinoma and submaxillary lymph glands.

If the skin can be saved, that is if it is completely intact and freely movable above the tumor, the incision is made from the angle of the mouth down to the submaxillary region bending at the height of the hyoid bone into a horizontal incision. The skin is dissected up and first the submaxillary region is exposed. The lymph glands with the submaxillary gland are removed *en masse* as described under D with the only exception that the connections with the mandible remain undisturbed. It is advisable to expose behind the posterior portion of the digastric the

upper and lower lip first so as to form a satisfactory angle of the mouth.

Gloves are now changed again. The cervical wound is revised and a drain with the point under the mandible inserted (Fig. 7). The skin is closed in the direction from below upward. It may be necessary to lengthen the originally transverse incision in front and behind and to mobilize the resulting quadrangular flap in order to get a suture line without tension. This is very important because a sure and safe covering of the reflected flap should be accomplished. If this is not the case, disagreeable fistulae may develop through which saliva or even food particles may be discharged.

Next the facial flap is turned down and sutured into place. The suture material should be very fine but resistant silk.

E. CARCINOMA WITH SKIN INVOLVEMENT

If the carcinoma has also involved the skin this must be excised extensively in normal tissue and the defect covered. A plastic of the skin of the cheek alone is just as inadvisable as a substitution of the mucosa without cutaneous covering. In both instances one can count on a marked contraction of the uncovered surface. If the defect of the mucosa is not attended to, a locked jaw will result; not covering the skin will result in a cosmetic failure. Thiersch grafts are just as ineffective. The slightest marginal necrosis or the cutting through of a suture will result in a fistula which requires a reoperation and union may not be secured. It is therefore important in cases of such defects to close both skin and mucosa in a reliable manner.

If the loss of skin is not too extensive, a reconstruction from the face itself is usually feasible.

The procedure is similar to that described under D except that instead of beginning with a rectangular incision which forms the facial flap, one begins with the excision of the carcinomatous skin or with the skin still intact which is bound down to the underlying tumor (Fig. 12). This carcinomatous area, if it is not too large, should be excised in round or oval form. In case the angle of the mouth does not need to be excised, a transverse incision connects the angle with the anterior margin of the excision. First the carcinoma is extirpated from the mouth as described under D. Now the extent of the defect is measured and if suitable, a Gersuny flap is formed in the submaxillary region (Fig. 13). The submaxillary region and the upper deep cervical lymph nodes are removed and Gersuny's flap as shown under D is sutured into the defect of the mucosa. To

cover the skin defect an incision is carried along the margin of the mandible which turns upward at the angle of the jaw and reaches the level of the zygomatic arch before the ear (Fig. 14). Through this incision the entire skin of the face up to the orbit and zygomatic arch is mobilized. Now the skin can be easily drawn forward into the defect (Fig. 15) the margins being united with fine silk. Secondary defects do not remain as a rule especially if at the periphery of the wound a few sutures are made in the radial direction.

Figure 25 shows a case operated on in this manner.

F. CASES WITH EXTENSIVE SKIN DEFECT

If the defect of the skin is extensive or even involves the submaxillary region, the flap can be outlined in such a manner that some more skin is taken from the temporal region. The incision described under E is continued upward before the ear toward the temple, then turned back with a curve and carried down to the region of the upper orbital margin (Fig. 17). This results in a large flap, the base of which is in the zygomatic region. After adequate mobilization the defect can be covered very nicely (Fig. 18). A secondary defect may sometimes ensue in the temporal region and is covered by a Thiersch graft.

G. LARGE DEFECTS OF THE CHEEK

For very large defects of the cheek, great flaps from the hairy portion of the skull are the best. These are made according to Esser with nothing but the temporal artery as a nutritional stem. An incision is made before the ear straight upward as high as the lower margin of the flap is planned. The flap is mapped out in quadrangular or circular form so as to fit into the defect (Fig. 19) and the temporal artery with the concomitant vein is dissected clear out of the surrounding fatty tissue, great care being taken not to injure the vessels. Special care must be exercised at the origin of branches which must be well isolated and tied and at the lower margin of the flap where the vessels enter. Only after a complete isolation of the temporal artery and vein should one cut out the flap. The incision should penetrate down to the temporal fascia or to the bone and it is best to pull down the skin flap from above, the flap hanging only on the narrow stem of the temporal vessels (Fig. 21). If the defect in the skin reaches laterally to the preauricular incision, then the whole flap with the artery, after a satisfactory twist is laid into the defect. However, if a strip of normal skin lies between the defect and the incision which exposed the tem-

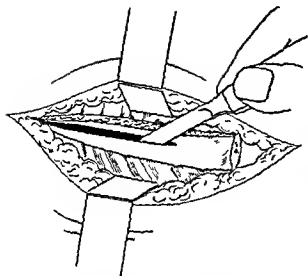


Fig 4 Incision into the pleural cavity The lung is found in collapse because of the pneumothorax

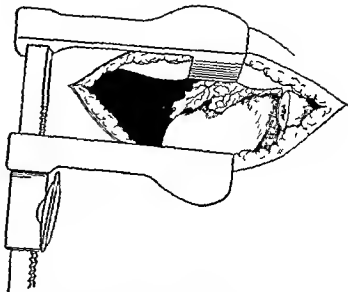


Fig 5 A retractor separates the rib so that the cyst and lung are more readily accessible

tor is opened the adjacent ribs are pressed upward and downward, respectively, and the wound opens

10 Exploration At this stage one may explore the heart and the great vessels, the lung, the mediastinum and the diaphragm. It is apparent that when one has to deal with a diaphragmatic hernia, thoracotomy must be made at the level of the seventh or eighth rib, also if there is a cyst of the superior pulmonary lobule thoracotomy should be made correspondingly at the level of the tumor, third, fourth, or fifth rib, according to the individual case. When the exploration has been made and the diagnosis confirmed or altered, one continues the operation.

11 Let us suppose the case is of the type most frequent among us, i.e. a hydatid cyst. With Hartmann's forceps or another similar instrument, which injures the lung as little as possible, the lung is fixed at four cardinal points about the tumor and drawn up to the wound. The pleural cavity is protected as much as possible with compresses moistened in warm sterile water.

12 Treatment of the cyst If an aspirator is at hand the cyst is punctured and its contents aspirated, having done which, the lung is incised at the site of the puncture orifice in order to lay open the cyst cavity well. If an aspirator is not at hand the cyst may be incised directly and its contents evacuated with gauze sponges mounted on a long forceps. Intracystic manipulations, both aspiration and rubbing of the cyst walls with compresses frequently provoke cough. The "for lette" of the cystic cavity must be made with care and in the same manner whether one is dealing with a sterile cyst or an infected one.

13 If the content of the cyst is sterile, the wound of the lung is sutured with deep and superficial interrupted catgut stitches to provide hemostasis and prevent all communication between the cystic and pleural cavities.

14 If the content of the cyst is infected the edges of the pulmonary wound are secured to the border of the thoracic wound in order to drain the cystic cavity.

15 In order that the junction of pulmonary and thoracic wounds shall be secure and prevent all communication between them and the pleural cavity, it is not sufficient, as a rule, to suture the lung to the parietal pleura and costal peritoneum which form together the deepest layer of the wound, it is necessary to suture the lung to the

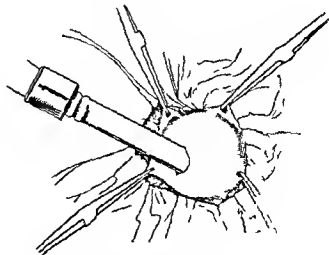


Fig 6 With forceps the cyst is brought up and the cyst punctured and aspirated

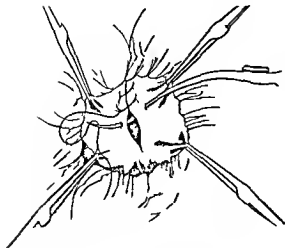


Fig. 7 If the content of the cyst should be found sterile the cyst may be aspirated and the wound closed without drainage

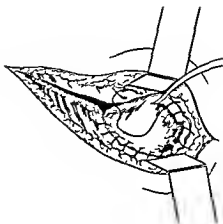


Fig. 8 If the content of the cyst is infected or for other reasons it is not best to close the cystic cavity the cyst walls are sutured to the borders of the thoracic wound

thoracic muscles by which means the closure is not only made secure and firm but the wound is completely divorced from the pleural cavity infection of which is always so grave a complication

16 When the junction is completed between lung wound and thoracic muscles the muscle itself is closed throughout the remaining portion of the wound care being taken to close the pleural cavity completely

17 A drainage tube is placed in the pulmonary cavity and the skin sutured leaving the opening just large enough for the above tube

18 If in place of drainage of the cystic cavity the pulmonary wound is sutured the lung is left free in the pleural cavity and this cavity is cleansed with great care

19 A dressing of gauze and a large amount of cotton is applied in order to completely isolate the wound

POSTOPERATIVE CARE

When the operation is over the patient is carried to his bed where he is made to sit upright and is protected from cold or sudden changes of temperature particularly during the first 8 or 10 days

If the wound has been drained it is necessary to change the dressing daily if not the dressing is not removed until the seventh day unless there should be elevation of temperature local pain or other symptoms which necessitate examination of the wound at an earlier period

It is well to watch daily the function of the circulatory and digestive systems Beginning with a limited liquid diet food may be increased rapidly until by the fifth or sixth day the intake may correspond with that during normal health

The possible complications encountered are

1 Serofibrinous or hemorrhagic drainage into the pleural cavity This is signaled by moderate fever and pain in the side Physical examination and roentgenography may help in the diagnosis especially when the drainage is of considerable amount a rather rare occurrence Ordinarily the drainage reabsorbs spontaneously but if the fever or pain persists it is well to do a puncture and aspirate the liquid after which the condition is cured

2 Perifocal pneumonia, and in the case of hydatid cyst pericystic pneumonia The diagnosis is made by fever, dyspnea and physical and roentgenological signs of hepatization It is combatted in the same manner as ordinary pneumonia

3 Purulent pleurisy and septic bronchopneumonia These complications are not frequent and are either from an operative infection which in the present state of science it is possible to avoid, or from an oral infection or some other source, susceptibility of the patient being increased by his poor general health These patients are treated as though they were suffering from a new malady, the operation already performed being taken into account

PROGNOSIS

If complications do not supervene thoracotomy is usually well borne and even when the operation is a severe one the prognosis is comparatively good On the other hand the prognosis is considerably more grave in the presence of complications If one excepts the cases of non purulent pleural drainage all the complications of thoracotomy have a very grave prognosis

FROM THE LAHEY CLINIC

THE TECHNIQUE OF THE TWO STAGE OPERATION FOR PULSION OESOPHAGEAL DIVERTICULUM

By FRANK H LAHEY M.D. F.A.C.S. BOSTON

THE surgical treatment of pulsion oesophageal diverticulum was first suggested in 1830 by Sir Charles Bell, who proposed the establishment of a fistula to empty the diverticulum of its contents. This was practiced in 1877 by Karl Nicoladoni in Vienna.

Kluge in 1850 conceived the idea of excision which was first done in 1884 by Niehaus on a patient who had both a goiter and an oesophageal diverticulum. Niehaus first removed the goiter and when the symptoms were not relieved after 15 days, excised the diverticulum. The patient died on the twenty fourth day of hemorrhage from the superior thyroid artery.

In 1892 von Bergmann reported a successful case of extirpation and in the same year Theodore Kocher performed the operation with healing by first intention.

A new method of procedure was proposed and practiced with good results by Girard in 1896, namely the invagination of the diverticulum and the suturing of the oesophageal walls. In a case operated upon in this manner by Waggett, the pouch came out again after 8 months, upon violent sneezing of the patient, and on the second operation (excision), was found to occupy the same space as when first found. This procedure was elaborated in 1917 by Bevan who inverted the outer half of the sac and then buried the stump with a series of purse string sutures.

Diverticulopexy was proposed by Schmid in 1912, who, in the dissecting room, fixed the bottom of the pouch at a higher level than its neck. In 1917 this was practiced by Hill on the living subject with at least temporarily good results.

Up to 1910-1915 the popularity of surgical treatment of oesophageal diverticulum was inhibited by the rather high mortality rate which followed one stage operations on the diverticulum because of leakage from the suture line or the ligation at the neck of the diverticulum the oesophagus being notably unreliable in its ability to heal tightly after suture. It is to be recalled that the course of the diverticulum from its origin at the level of the cricoid as it enlarges is downward beside the oesophagus behind the pretracheal fascia into the posterior mediastinum, and that when it is extracted from this location,

its neck sutured and sac cut away, the leakage from the suture line, which so frequently follows, will naturally be downward into the mediastinum along the tract from which the diverticulum was removed.

In 1909, therefore a two stage operation was proposed and done by Edwin Goldmann in Freiburg, the pouch being freed its pedicle ligated with silk, the wound packed and the sac fixed to the surface of the wound. This resulted in sloughing of the diverticulum and on the eighth day a fistula was formed which healed in 2 months. This two stage method was improved by Murphy in that he implanted the sac in the wound with its neck unligated, thus preventing sloughing, and resected it 2 weeks after the first stage when the wound was granulating.

In 1918 Judd reported a modification of this method whereby the edges of the skin were sutured to the neck of the sac, the wound closed, and the sac left as in an unopened colostomy, lying upon the skin. Ten to twelve days later when healing had taken place within the wound and about the neck of the sac, it was cut away without an anesthetic and the portion of the sac lying in the canal dissected away down to the oesophagus.

The use of this two stage procedure, as has been so often the case in the recent progress of modern surgery, has provided a method by which a hitherto extremely hazardous surgical procedure may be made very much more safe, eliminating as it does, when care is taken to prevent opening the sac during dissection, the danger of cellulitis of the neck and the almost universally fatal mediastinitis.

The skin incision is made from just above the level of the cricoid cartilage down to the clavicle along the anterior portion of the sternocleidomastoid. It is carried down through the skin and platysma until the anterior border of the sternomastoid is identified and retracted outward. The outer border of the sternohyoid muscle is then identified on the inner side and the upper pole of the thyroid gland is readily recognized beneath and above this structure. The whole thyroid gland is then exposed by gentle separation and retraction outward of the sternomastoid muscle.

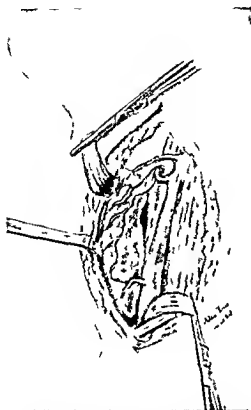


Fig. 1 Showing the exposure of the outer border of the thyroid with the edge of the sternohyoid retracted toward the median line and the sternomastoid outward. The omohyoid has been cut between clamps and the relations between the common carotid artery, internal jugular vein and outer border of the thyroid are shown. The structures in all of the illustrations are shown quite diagrammatically without their adherent and surrounding cellular tissue to make the surgical relationships stand out more clearly.

and the internal jugular vein and common carotid artery from the external border of the gland (Fig. 1).

This frequently brings into view the middle thyroid vein running from the internal jugular vein to about the center of the thyroid gland. This is ligated between clamps and tied which makes it possible to lift the lobe of the thyroid up from its bed and rotate it toward the middle line, where it may be held by a small two bladed retractor (Fig. 2). This exposes at once the upper portion of the trachea at its junction with the thyroid cartilage and behind this may be seen the lateral walls of the esophagus. The posterior belly of the omohyoid at this point occasionally interferes with exposure of the esophagus and may be cut between clamps at its tendinous portion to facilitate the approach to the sac of the diverticulum. If the sac be small it will be behind the esophagus usually slightly to the left of the

midline just below the level of the cricoid cartilage. It may be grasped by blunt tenaculum forceps and gently pulled from behind the esophagus and the adhesions between the esophagus and the wall of the sac freed as in the description in the following paragraph. If large the dome like top of the diverticulum sac with each act of swallowing may be seen to bulge up out of the mediastinum just above the clavicle at the lowest portion of the incision. With the employment of novocain infiltration anesthesia the conscious patient is able to assist greatly in the demonstration and removal of the sac since he is able to elevate the whole sac at will by swallowing. This has been a great advantage and has made the removal much easier than in the cases in which we employed a general anesthetic.

The sac is then grasped with tenaculum forceps and gentle upward traction made upon it (Fig. 3). Care must be exercised at this point lest too vigorous traction upon the tenaculum forceps tear the wall of the sac which is often thin and thus produce what may be fatal leakage.

With blunt scissors as the sac is lifted from its bed adhesions close to the sac may be separated and cut the sac being gradually extricated from its position in the mediastinum until it is entirely delivered into the wound. In most cases the sac may be gently separated from its surroundings with but very little cutting. Fairly firm adhesions about the lower portion of the sac will however occasionally be found to interfere with its ready delivery. In such cases it is necessary that the severance of these adhesions be made close to the sac under direct vision and with good exposure in order that pleura and thoracic duct be not injured.

The complete delivery of the sac particularly if it is a large one often permits it so to fill and distend with air that it is a disadvantage in that the size of the distended sac interferes with the exposure of its neck. Pressure upon the sac expels the air and also any mucus which is in the sac. In the patient operated upon with local anesthesia this should not be done without a warning that some mucus may be expelled into the throat which he should be prepared to cough up. The large sacs however often tend to refill and distend with air. As soon as the sac is delivered from its position in the chest a small gauze strip wrung out in warm salt solution should be introduced into the resulting cavity to protect it against possible infection should the sac be accidentally punctured and also to protect the pleura against possible rupture should violent coughing occur.

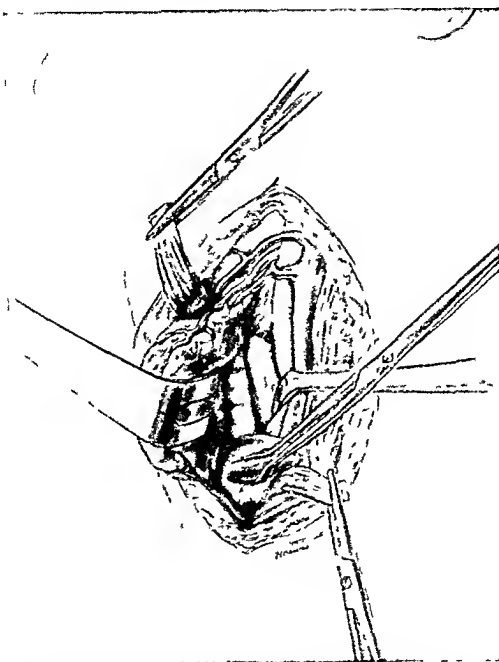


Fig 2 The thyroid rotated toward the midline. Attachment of the thyroid to the trachea was not shown in order that the relation between the trachea, oesophagus and diverticulum might be shown. The great vessels are retracted and the top of the diverticulum grasped with Babcock's intestinal forceps and partly pulled from the mediastinum.

With the greater portion of the sac delivered into the wound (Fig 3), it is next necessary to free thoroughly the adhesions of the sac to the oesophagus and to demonstrate clearly the portion of the sac joining it to the longitudinal oesophageal tube. Due to the fact that the neck of the sac is at its topmost point as would be the opening of a jar, the sac extending down along the oesophagus becomes adherent to the oesophagus only along its anterior and internal walls.

By gentle traction upward on the body of the sac, the adhesions between the sac and oesophagus are separated with scissors by alternate blunt and sharp dissection as is required until the neck of the sac is completely freed (Fig 4, a). Care must be exercised in clearing the neck of the sac, lest excessive zeal result in the dissection being carried through the wall of the sac at the neck, causing dangerous leakage and possibly fatal soiling.

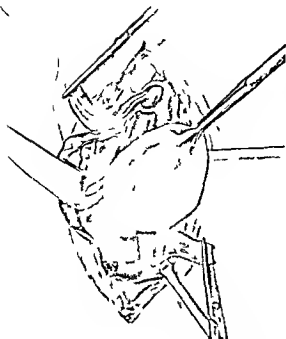


Fig 3 The sac delivered entirely. This illustration shows the cavity from which the diverticulum has been delivered. The diverticulum is shown also partly distended with air.

The sac having been freed of the adhesions about its neck on all sides is now implanted in the wound. Stitches of fine catgut are placed between the edge of the sternohyoid muscle and the wall of the sac in front and between the edge of the sternomastoid muscle and the wall of the sac in back care being taken to see that these stitches are placed at the proper level on the wall of the sac so that the esophagus is not drawn out into the wound and angulated. This may be best accomplished by a rough measurement with the finger of the distance between the neck of the sac when the esophagus is in its normal position in the middle line and the point at which the sternomastoid and sternohyoid rest naturally in contact with the wall of the sac (Fig 4 b and c).

It is very necessary in placing stitches that care be exercised lest the stitches penetrate the sac walls too deeply perforate the sac and produce later an unsuspected leakage with wound infection and possible mediastinitis.

At the upper and lower limits of the sac a stitch is placed through the sternohyoid in front, through the highest and lowest points of the sac and through the sternomastoid behind, so that

the angles at the lowest and highest points of approximation of the muscles front and back are closed.

A small cigarette drain is placed in the cavity in the mediastinum and brought out at the lowest angle of the wound the skin is closed and if desired also attached to the walls of the sac (Fig 4, d). If the sac is a small one it will tend to retract into the wound in which case it may be kept in its position on the neck for a few days by a stitch through the tip end of the sac with care that it does not penetrate the sac, and then through the skin over the back of the chest with traction on the skin to hold it outward.

The sac is then covered with sterile boric ointment strips and the patient returned to bed.

Patients as a rule are able to swallow immediately after the operation is over due to the fact that the opening or mouth of the sac is no longer at its uppermost point and in the direct line of descent of food as is the case when the sac extends downward into the thorax. In this position not only does the opening of the sac yawn open to catch food but as the sac enlarges from filling and makes traction downward on its neck the true opening of the esophagus is closed and assumes a lateral position. With the sac pulled up and implanted in the wound the diverticulum opening immediately assumes a lateral position on the esophageal wall and traction upon the neck of the sac opens the true esophageal opening so that the course of swallowed material is in the proper direction.

The sac is left in the wound for 10 to 12 days at the end of which time the skin about the neck of the sac is infiltrated with novocain and the sac cut away leaving the mucous membrane of the diverticulum flush with the skin (Fig 5 a). With Allis forceps the mucosa may be grasped at the skin level and by means of blunt scissors gently separated from the submucosa (Fig 5 b) down to the point where the mucus lined canal joins the longitudinal esophageal canal. The mucous membrane is imputed at this point (Fig 5 c) and the canal packed with a boric ointment strip (Fig 5 d). It is important to estimate the approximate distance from the level of the skin to the point at which the diverticulum joins the esophagus and not to excise mucous membrane beyond this probable point.

Following the removal of the mucous membrane lining the canal which leads from the skin to the esophageal canal there is an escape of swallowed food and liquid in varying amounts and for a variable length of time. In those patients with small sacs (Fig 9) the sinus in the

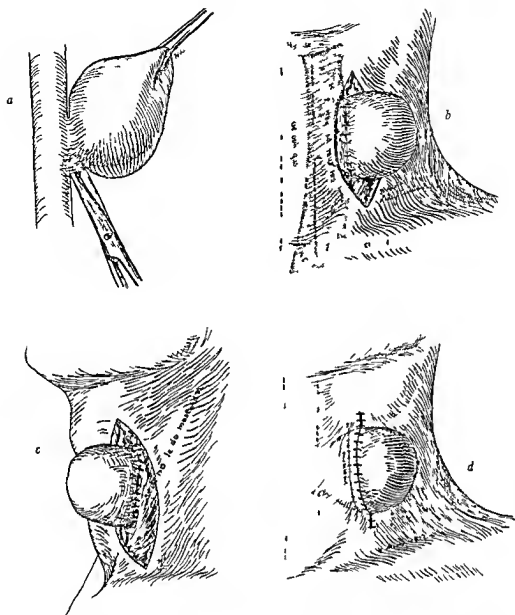


Fig 4 (a) Diagrammatic drawing showing the separation of the adhesions up to the neck of the sac between the interior and lateral walls of the diverticulum and the oesophagus (b) Implantation of the sac in the wound. The suture of the prethyroid muscles anteriorly to the wall of the diverticulum. Note that the oesophagus is in the midline and that the prethyroid muscles are shown as sutured to the sac at the point where they naturally come in apposition to it (c) Suture of the sternomastoid muscle posteriorly to the wall of the diverticulum (d) The skin sutures attached to the wall of the diverticulum. Note the proper approximation of the muscles and skin to the wall of the diverticulum as compared with the diagrammatic drawing Figure 6 in which the attachment is made at the neck of the sac with resulting angulation of the oesophagus

neck has generally closed completely within 2 to 3 weeks. In the patients having very large sacs (Fig 8) extending into the thorax the length of time before complete closure of the sinus has been from 3 to 6 weeks. With the wound packed with a boric ointment strip we have had no difficulty with patients getting down an insufficient amount of nourishment. A moderate

amount of both liquid and solid food escapes from the wound at first, but this quickly diminishes in amount and with stimulation of the walls of the sinus to hasten closure, it soon ceases entirely. The scar which results from the closure of the wound by granulation is at first a retracted one but within a few months pulls out to the level of the skin and is quite satisfactory.

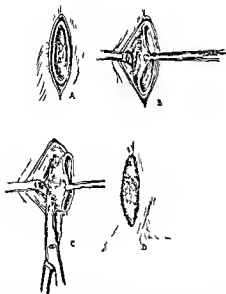


Fig 5 (a) The diverticulum cut off flush with the skin showing the mucous membrane lined canal leading down to the esophagus. (b) Separating the mucosa from the submucosa. (c) Mucosa separated from submucosa down to the point where the canal meets the esophagus and ready to be cut away with scissors at this point. (d) The resulting cavity packed with boric ointment gauze.

After the wound is closed the patients are instructed to return either to the clinic or to their laryngologists for the passage of bougies for at least a year after operation. If the theory of the origin of pulsion diverticula is true, that they result from a lack of neuromuscular co ordination

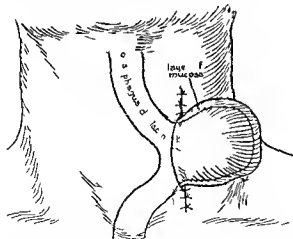


Fig 6 Diagrammatic drawing showing distortion of the esophagus due to dragging the esophagus too far out into the wound and application of the stitches between the skin and muscles too close to the neck of the sac. A large sac which becomes over distended from air within it tends to draw the esophagus out of line in the same way

of the constrictors and cricopharyngeus muscle and incoordinate constriction of the cricopharyngeus produces bulging of the mucosa above it through a weak point in the posterior esophageal wall then it is evident that the factors which originally produced the condition are still present and measures directed toward preventing a return of the herniation are well indicated. We have therefore advised these patients to return at regular intervals for post operative dilatation.

The complications arising in connection with this operation are neither serious nor numerous if but ordinary care be observed in the course of its performance. Leakage from the sac follows either puncture of the sac during its dissection or is the result of a needle bite unintentionally penetrating all of the sac wall and permitting escape of its contents. This is particularly to be avoided and, as has been stated care is to be especially exercised in placing stitches in the sac of the diverticulum lest the needle puncture all the layers of the sac wall. There is danger, we feel under such conditions that deep wound infection as the result of soiling may occur with the ever present possibility of fatal mediastinitis.

Necrosis of the sac wall occurred in one of our cases while the sac was still implanted and unopened in the neck, as a result not of any constriction of the blood supply of the sac at its neck.

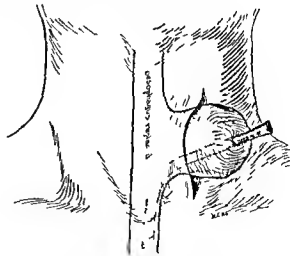


Fig 7 Diagrammatic drawing of the esophagus replaced into its proper position and with tube passed through the diverticulum down the esophagus to the stomach and sutured by a pursestring suture into the apex of the sac. This procedure was employed in the case with esophageal distortion before the esophagus was replaced into its normal position in order to supply the patient immediately with food and fluids.



Fig 8 Roentgenogram of a large diverticulum filled with barium. Anteroposterior view.

but in all probability of constant distention of the sac with air. In this patient the sac soon after implantation in the wound and for 8 days afterward remained stretched and fully distended upon the neck. Necrosis of the wall will not result in perforation under 8 to 10 days, by which time healing has so advanced about the neck of the sac that infection will not take place.

Should the sac become unduly distended, a large sized rubber catheter may be sutured into it with the result that the sac can be kept constantly emptied.

We have observed interference with swallowing in but one case. This was in a patient with a large diverticulum (Fig 6), the neck of which we implanted too close to the skin resulting in the oesophagus being so pulled outward from its median and longitudinal position (Fig 5) that it was angulated to the degree that interference with the descent of food resulted as could readily be demonstrated by fluoroscopy. When this patient was fed a thin barium gruel, by fluoroscopy the mixture could be seen to spill over the epiglottis and enter and descend into the bronchi. As soon as this was noted with the wound carefully protected with boric ointment strips, the sac was opened, and guided by the finger a medium sized rubber feeding tube was passed into the diverticulum, through the neck of the diverticulum and again guided by the finger down the oesophagus and pushed into the stomach. A purse string suture fixed the tube into the opening at the apex



Fig 9 Roentgenogram of a small diverticulum filled with barium. Anteroposterior view.

of the sac and feedings were carried out without difficulty through the tube (Fig 6). Within a few days, when the patient had improved under the introduction of food and fluids through the tube, the wound was reopened, the stitches attaching the sac to the skin and muscle cut, and the oesophagus so replaced in its median and longitudinal position that its angulation was overcome (Fig 6). Stitches were again introduced but high enough upon the wall of the sac of the diverticulum so that the oesophageal tube was held in its median position and the patient experienced no further difficulty with swallowing.

Angulation and dragging of the oesophagus into the wound tends to result from overdistention of the sac, and in those cases in which it occurs, the introduction of a tube into the sac should immediately be undertaken.

From our experience with this case, we feel that gastrostomy as a preliminary procedure in patients who have not been able to take nourishment on account of oesophageal obstruction from the diverticulum is no longer indicated. Since delivery and implantation of the sac is so readily and painlessly accomplished with local anaesthesia and without shock, and since a tube may so readily be sutured into the apex of the sac after it has been passed through the neck of the diverticulum down into the stomach, there is every advantage in accomplishing both the delivering of the sac and the introduction of a feeding tube at one sitting rather than in employing a preliminary abdominal operation, gastrostomy.

CERVICAL RHIZOTOMY FOR PAIN IN CARCINOMA OF THE NECK

By TEMPLE FAY M.D. PHILADELPHIA

From the Department of Neurosurgery of the University Hospital

THE frequent involvement of the cervical plexus or submaxillary region by extension or metastasis from primary carcinoma of the mouth produces extreme pain in the cervical distribution as the growth enlarges and involves the anterior border of the sternomastoid muscle catching the superficial cervical nerves on their way to their skin surface distribution over the posterior aspect of the head below the jaw and in the neck. The suffering may be intense and only controllable by large doses of morphine, the patient never being entirely free from pain.

In order to relieve this pain and to allow the remaining days of life to be as comfortable as possible rhizotomy of the upper four posterior cervical roots has been undertaken by the author in three cases with the following results:

CASE 1: Carcinoma of the mouth with extension to the left side of the neck. Pain in the upper cervical distribution. Left cervical rhizotomy. Relief of pain. Recovery. J. D. aged 61 was admitted to the neurosurgical service of the University Hospital September 24, 1924. He was referred by Dr. Eugene I. Pendergrass. Diagnosis: secondary carcinoma left side behind the angle of the jaw with severe occipital pain. Patient complained of pain in the lower half of the face and back of the head. A large mass was present behind the angle of the jaw on the left side.

The patient was perfectly well until 2 years ago when he developed a sore in the roof of his mouth. Tumor was associated with this but no pain. Hoarseness of the voice followed shortly after. Local treatments were given by a physician for 1 year. Pain in the pharynx developed and the patient was referred to Dr. Hancock for roentgen ray treatment which was given and the growth in the mouth subsided. Three months ago he began to have pain in the lower portion of the face and posterior half of the head requiring morphine constantly which helped but did not relieve the suffering. About 2 months ago a swelling appeared behind the left sternomastoid muscle. Hoarseness has lessened and the general condition seems improved following irradiation. He feels fairly well except for pain. He has lost 17 pounds in weight during the last 4 months.

Physical examination: Blood pressure 145-85. The patient is a small adult male in apparently good health. Mentality is good. Speech is thick as a result of the destruction of the left side of the hard palate and tongue. He has pain on the left side of the head and scalp which is referred to the midline and the vertex posteriorly. The eyes show no exophthalmos, no ptosis, nystagmus nor ocular palsy. The pupils are small, clear, regular and respond to light and accommodation. He is unable to hear ticking of watch in either ear. No mastoid tenderness. The nose is negative. The teeth are absent. The tongue

edematous on the left side and slightly sore. No ulceration but moderate hyperaemia. The tonsil and posterior pillar on the left side seem to merge into the swelling which extends into the throat and is hyperaemic only slightly tender and not ulcerated. The right side of the mouth appears quite normal. The gums are normal. The uvula is absent. The hard palate is pale and apparently normal. The nasopharynx is injected. The left side of the neck presents a large glandular swelling behind the angle of the jaw and below and behind the ear. The gland is stony hard fixed and not tender or very slightly so. Only the anterior and upper cervical chain is involved. The heart is negative. The lungs clear. The abdomen negative. Examination of the upper extremities shows numerous coal markings and small scars. The radial pulses are equal, synchronous of normal rate, volume and rhythm. The arteries are moderately sclerotic and tortuous. Movements are normal except that there is limitation in extension at the elbow joints. Power and sensation are normal. Reflexes are present but diminished and equal. Examination of the lower extremity shows a scar of an old compound fracture of the right tibia. Movements power and sensation are normal. No Romberg, Babinski or clonus. Knee jerks present on re-enforcement. Achilles reflexes absent. Diagnosis: Neuralgia of the occipital nerves greater and lesser attending metastatic carcinoma.

Operation August 11, 1924. Cervical rhizotomy under local anesthesia by Dr. Fay. After careful preparation of the field an incision was made in the midline under local anesthesia from the occipital protuberance to the seventh cervical spine. The muscle layers were divided in the midline and the spinous processes disclosed. Because of the contour of the second cervical the muscles had to be dissected free from the sides of the spinous processes with the knife. There was little hemorrhage during this step. The lamina of the atlas axis and second cervical vertebrae were removed with rongeurs exposing the underlying dural covering of the cord.

At the completion of this step all bleeding was carefully controlled so that the field was dry when the dura was opened. The dorsal roots presented on the left side as follows: The first posterior cervical root given off the cord was composed of several small filaments, the highest was larger than its fellows. It was closely approximated by a smaller filament about the size of a hair pin. The next group appeared to be of four fine filaments which converged to make the second cervical root at the point of exit having been joined by the two directly above. Below this point there were two more roots composed of three fine filaments each. A silk ligature was passed around the first and second and one each around the three other groups (Fig. 1). This was made possible and easy by the use of a blunt dural needle without traction on the cord. The posterior roots were tightly tied by

A t t m a l s a g r e e t h t h f i r s t v e l e g m n t f i h d e r e y g e r t a p o s t e r t a n d w h e p r s e i i y a e f e m e n t w i t h t h t o e p e s e i t n h e n c t h f i r s t p o l r e v t t h t h t g o u s e e s f m h g e n d e r y e l g m n t t h c n d i n t h e e f e d s e e d c e r v i c a l p e r i o r i t E r t h p r o p o s e t h p a r t h r o o t s f e d i r e t a k p a s t h e y p p e t o t h a g n t h e f i l d o f p e r a t o n d o i n r e l a t o n t t h e s e g m e n t o f t h c o r d f r o m w h i c h t h e y a

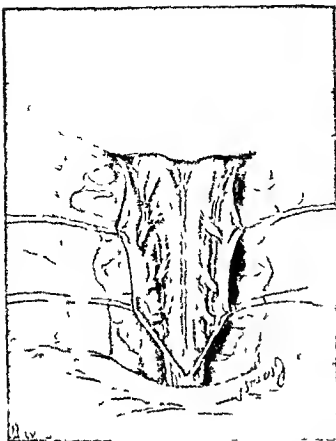


Fig 1 Ligation of the first three posterior cervical roots on the left for relief of pain due to involvement of the cervical nerves by carcinoma of the neck. Case 1 (Reprinted by permission of *American Journal of Roentgenology and Radium Therapy* July 1925)



Fig 2 Case 1 Patient after ligation of upper three posterior cervical roots on the left showing area of anesthesia for pain and temperature. Growth was situated just below the left ear. Complete anesthesia in area of cross lines behind the ear. Loss of pain and temperature in area outlined. Note scar of operation below the occipital protuberance. Complete relief of pain obtained (Reprinted by permission from the *American Journal of Roentgenology and Radium Therapy* July 1925)

square knots and the threads closely cut. No hemorrhage occurred during this stage of the operation. The field was dry throughout the dura was closed securely and no blood was allowed to enter the canal. Muscle and skin closure was done by tier silk sutures with drainage.

The patient was returned to the ward in excellent condition. Local anesthesia was used up to the point of incising the dura and then light ether anesthesia was begun which was perfect in its administration and effect so that there was no reaction on the part of the patient as the dorsal roots were tied. It was interesting to note the surprising lack of shock in this procedure. The patient's blood pressure did not fall below 120-60 at any time. Time duration of operation, 3 hours.

August 12, 1924 postoperative condition was excellent. The drain was removed. Anesthesia zone was tested and found present well over the occiput and close behind the ear and for a short distance downward to the neck. (Fig 2) The patient has no pain and morphine has been discontinued.

September 7, 1924 the wound is healing well and is quite clean. Dressings are to be continued at surgical dispensary. He has no pain. Discharged. His morale is improved, he feels perfectly comfortable. He is to return for subsequent radiation.

The patient returned home and resumed work on his farm. Six months later he was still free from pain. He had lost weight and the growth had enlarged. At the next follow up 9 months after operation no reply was received and all efforts to obtain information as to the

final outcome have been unavailing. It is presumed that he died between 6 and 9 months after the operation.

Case 2 Carcinoma of the mouth with extension into the right side of the neck causing intense cervical pain. Operation. Cervical rhizotomy. Relief of pain. Recovery.

G V, age 62 was admitted to hospital September 26, 1923. He complained of pain in the right side of the face and neck. The patient first noticed a lump under the tongue on the right side about 1 year ago. He had no pain at that time. About 5 months ago the lesion began to grow rapidly. Four months ago he had a moderate amount of pain characterized by smarting and burning in the mouth on the right side. The pain was not particularly affected or exaggerated by food or drink. It became constant in character. He was treated for the sore and pain but no positive diagnosis was made by the local physician. Three months ago the patient was advised that the mouth lesion was carcinoma. He was then referred to the University Hospital and the diagnosis confirmed by Dr. Pancoast and Dr. Pendergrass. The patient was given radium treatment for 2 weeks. He returned home for 1 month and then was readmitted for further radiation. Upon his second admission he complained of severe pains below the angle of the jaw on the right side and also over the back of the head as high as the vertex on the right side. The pain increased over the back of the head and in the neck so that large doses of morphine were required. Three to four grains daily failed to give relief. The patient was referred to the neurosurgical service for operative intervention.

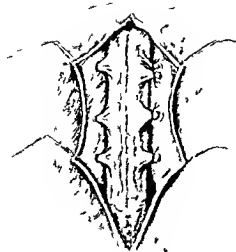


Fig 3 Case 2 showing ligation of the first three posterior cervical roots on the right for carcinoma of the neck involving the cervical plexus. Complete relief of pain for 3 months. Pain of different character later developed due to extension of growth to cervical sympathetics.

Physical examination Blood pressure readings were 148-95. The patient is a well nourished white male of 63. He co-operates well and is of fair mentality. The head is grossly negative. He has no facial weakness, no extraocular palsies. The pupils react promptly to all reflexes. The ears and nose are negative. The mouth has marked fetor oris. The tongue is restricted in its movements because of the involvement of the tip and lateral aspect on the right side by the carcinoma. On the right side of the neck there is a firm, hard, fixed mass, the size of a lemon, just below the tip of the mastoid and extending along the anterior border of the sternomastoid muscle to within a few centimeters of the clavicle. The heart, chest, abdomen and extremities are essentially negative.

On October 23, 1925 a right cervical rhizotomy was done under local anesthesia by Dr. Fay. A midline incision was made from the external occipital protuberance to the level of the seventh cervical spinous process. Dissection was carried down the midline over the tips of the spinous processes. The muscle layers were divided; the muscle attachments freed from the sides of the spinous processes by dissection because of the contour of the second cervical vertebra which is bifurcated. The deep muscles were retracted; the lamina of the first five cervical vertebrae exposed and some of the muscular attachments near the midline at the base of the occiput were also freed. This gave an exposure of the axis and posterior lip of the foramen magnum. The spinous processes were removed and the lamina divided by rongeur including the axis; the lamina of the first four cervical vertebrae being entirely removed. The underlying dura then presented. Hemostasis at this stage was carefully controlled by ligatures and bone wax so that the wound was free from bleeding at any point. Dural sutures were then placed and the dura incised. The arachnoid was seen beneath and it was necessary to incise this structure separately. The posterior roots were immediately exposed, especially the upper three

cervicals. Ether was begun at this point. The first root appeared very small, quickly joining a larger structure just below and with a small filament still lower seemed to compose the first cervical posterior root (Fig. 3). The second root was composed of three fine filaments which converged to a common root. The third and fourth were likewise composed of three or four filaments each; the first root was crushed by a hemostat and fibers tied with silk. The second, third and fourth roots were also crushed and tied. There was a small arachnoidal vessel which was torn in passing the ligature under the fourth cervical root and required a silver clip. The field was entirely free from hemorrhage at any time except a drop or so from the small vessel mentioned which was quickly secured. The dura was closed with a continuous silk suture; the muscle structures approximated with interrupted silk sutures in layers and the skin closed with silk as usual. As the wound was free from hemorrhage, no drainage was required. Operative time 3 hours. Patient returned to the Ward in excellent condition. He showed no evidence of shock at any time during the operation. Ether was discontinued during closure of the wound.

October 24, 1925 his condition is excellent and he voids well. He has no pain over the back of the head or in the neck. No morphine is required.

November 3, 1925 patient has been up for several days. Stitches have been removed and wound is healed. Patient has had no pain over the right side of the neck or back of the head since operation. He has slept well for the first time in 5 weeks.

December 4, 1925 a zone of anesthesia for pain is present from the midline anteriorly on the right just below the jaw to the clavicle; thence to the shoulder and posteriorly to the midline at the point of the incision from the seventh cervical spinous process to the vertex and down the side of the head on the right to the tip of the ear, including part of the ear and forward on to the face over the angle of the jaw (Figs. 4 and 5). Behind and below the ear is a small area which retains all sensation. In the area of the third division of the trigeminal nerve on the right and the first division over the top of the head.



Fig 4 (left) Case 2. Patient after ligation of first three cervical posterior roots on the right. Note scar in midline, extensive growth on right side of neck.

The lower level of anesthesia is shown above the right shoulder. This extended to the vertex on the right.

Fig 5 Case 2. Showing location of the growth and extent of anesthesia on the right side of the face after ligation of the first three cervical posterior roots on the right side. Note the extent of overlap on the cheek in the region of the fifth nerve. There was a definite qualitative loss of pain sensation here following rhizotomy.

almost to the forehead is an area of qualitative hypæsthesia for pain.

December 6, 1925 the patient has been free from his former pain for 6 weeks. He is now developing deep pain in the neck on the right side referred to the ear and deep in the throat. It is probably due to extension to involve the ninth nerve or sympathetic chain. Four months after operation the patient reports from his home that he is rapidly growing weaker. He has considerable pain in the region of the right ear and deep in the neck.

CASE 3. Carcinoma of the mouth with extension to the right side of the neck. Pain over the right side of the head. Posterior cervical rhizotomy. Relief of pain. Recovery.

C. W. was admitted, October 23, 1925 to the service of Dr. H. K. Pancoast. He complained of 'headache and swelling in the right jaw.

Patient was well until 3 months ago when he experienced severe pain on the right side of his head posteriorly. An ulcer was found in the right side of his upper lip. X-ray revealed erosion of the maxilla. Eight X-ray treatments were given, but the swelling appeared at the angle of the jaw on the right and 10 weeks ago he began to have severe pain located in the crown of the head on the right side and posteriorly. It varies from a sharp and shooting character to throbbing. The attacks have gradually increased in severity and the pain is extremely severe when he lies down. Attacks come on around 3 o'clock in the afternoon.

Physical examination. Blood pressure 112-76. The patient an adult male shows a large hard firm mass over the lower jaw on the right. He complains of pain below the ear and over the occipital area of the head on the right. The calvarium is grossly negative, the scalp negative. The face is asymmetrical due to a large hard firmly fixed mass over the right lower jaw about the size of a lemon. The corner of the mouth is pulled down and there is some facial weakness on the right due to distortion. Examination of the eyes shows ocular rota-

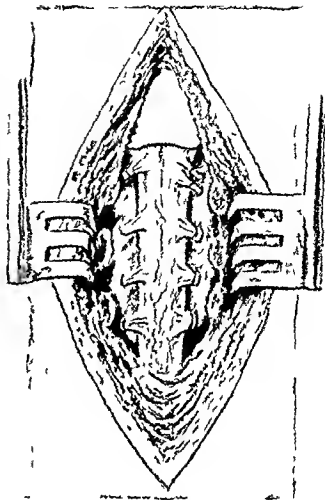


Fig 6. Case 3. Ligation of the first three cervical posterior roots on the right side, crushing of first posterior root on the left. Complete relief of pain.



Fig 7 (left). Case 3. Patient 2 weeks after cervical rhizotomy for relief of pain showing scar, extent of growth and area of anesthesia produced by ligation of the first three posterior roots on the right side.

Fig 8. Case 3. Lateral view of growth and area of anesthesia following cervical rhizotomy. Patient was completely relieved of pain to the time of his death two months later.

tions full, no nystagmus, pupils round, equal, and react to light and in accommodation. The ears and nose are negative. All teeth are missing except the lower first premolars. There is a large sloughing area on the inner surface of the right cheek and a deep crater on the roof and superior corner of the right side of the mouth. The tongue is restricted in its movements. The tonsils are moderately hypertrophied and cryptic. The nasopharynx contains shreds of mucus on its posterior walls. A few slightly enlarged lymph nodes are found on the right posterior cervical chain. The thorax is well developed with equal expansion. Breath sounds are vesicular. There are a few coarse rales over the large air passages on the right. The heart is not enlarged, rhythm is regular, no murmurs. Pulse rate 90. The abdomen is well muscled with no palpable masses. The extremities are negative. There is moderate arteriosclerosis. Reflexes are normal. No Babinski or clonus. Diagnosis: Carcinoma of the right maxilla with cervical extension causing pain due to involvement of the right superficial cervical plexus.

October 28, 1925 pain has increased in severity over the back of the head and neck on the right. Patient is referred to the neurosurgical service by Dr. Pancoast and Dr. Fendlergrass for surgical intervention to relieve the pain.

November 13 1923 a right cervical rhizotomy under local anesthesia was done by Dr Fay.

The usual exposure was made in the midline from the sixth cervical spinous process to the occipital protuberance. Dissection of the muscles was done down to the spinous processes. The freeing of the muscle attachments from the occipital bone on each side gave an excellent exposure. All laminæ were cleared of muscle attachments and the canal opened by rongeur. At this stage of the operation complete haemostasis of the field was effected and normal saline solution which was introduced returned perfectly clear. Several silver clips were placed on the small vessels next to the periosteal layer emerging from the canal. The foramen magnum was exposed for a distance of 1.5 centimeters on either side of the midline. The laminæ were rongeuired back to the level of the cord. After absolute haemostasis was effected the dural sutures were placed in the outer layer and the dura opened over the cervical portion of the cord. A considerable amount of cerebrospinal fluid appeared when the arachnoid was incised and the roots were seen on the right side in the following relations: the first cervical posterior root to appear was a fine lamina about the size of a hatpin; a second root joined it but was almost the size of a match. These two emerged together through a common opening in the dura. They were crushed and securely ligated. The next group of roots was composed of four fine filaments each about the size of a pin in diameter converging toward a common point of exit. A ligature was passed beneath this second group and securely tied after the roots had been thoroughly crushed. The third set of roots appeared like the second and were composed of three upper components about the size of a pin and two lower components of a slightly smaller diameter. These five converged toward a given point of exit in the dura. A ligature was placed around the group and securely tied. The roots were then crushed beyond the ligature (Fig. 6).

During the exposure of the posterior roots the spinal portion of the eleventh nerve was clearly seen passing between the anterior and posterior groups and gathering filaments from a point as low down as the third group of nerves ligated as described above. In passing the ligature around the first group a small pial vessel was injured and a slight discoloration of spinal fluid resulted. A tiny muscle graft was placed over the vessel and haemostasis was immediately effected.

In order to determine the supply of the first group of cervical posterior roots on the left these roots also were crushed with a haemostat. No ligature was placed on them. The canal was inspected and found to be free from any bleeding and the dura was closed by a continuous silk suture. Muscle closure was made in layers and a tube placed in the depth of the wound showed a return of clear fluid at the end of the operation from the region overlying the dura. This tube was removed and muscle closure made in order to secure a water tight approximation. Skin and subcutaneous sutures of silk were placed in the usual manner.

It is interesting to note that during the entire operation which lasted 3½ hours the patient's blood pressure was maintained throughout at the end of the operation was 126-68 almost identical with his pre-operative blood pressure readings. The pulse was never over 105 and the patient was returned to the Ward in good condition.

During the initial stage of the operation up to the point of ligation of the roots local anesthesia was maintained. The patient was then given a small quantity of ether during the process of ligation and he had completely recovered consciousness by the time the skin sutures were in place.

November 14 1923 patient restless. Temperature pulse and respiration were normal. Pain in the neck and face was greatly relieved.

November 19 1923 patient feels much better. Former pain in the neck and face is entirely absent.

November 21 1923 stitches have been removed the wound healed and patient is up and about the Ward. He is sleeping comfortably and requires no sedative or morphine.

November 30 1923 patient has no pain in cervical distribution on the right. Local lesion is increasing in size.

December 6 1923 an area of anesthesia is present on the right side from the midline anteriorly along the angle of the jaw over the parotid area including the exterior portion of the ear and running upward to the vertex to the midline then posteriorly to the level of the incision at the occipital protuberance. The lower limit of anesthesia shades into the shoulder girdle from the midline posteriorly to the midline anteriorly (Figs. 7 and 8).

It is distinctly interesting to note a zone of hypæsthesia over the distribution of the third division of the fifth nerve on the right in the region of the lower jaw as well as hypæsthesia which extends down from the vertex almost to the hair line of the forehead. An identical area is present on the left side due to destruction of the first posterior root on the left as well. There is no disturbance of sensation in a small triangle about the ear and just behind and below it. The patient was completely relieved of his former pain and desired to return home.

Two months after operation the patient suddenly died of pulmonary oedema probably from metastatic involvement of the lungs. He had been completely free from pain in the cervical distribution up to the time of death. There appeared pain referred to the third division of the fifth nerve during the latter 2 weeks of his life. This was probably due to extension of the growth to catch the mandibular nerve just above the ramus of the jaw.

TECHNIQUE

The steps of the operation are closely taken up in the operative notes of each case. The patient should be placed in the 'cerebellar position' on the face with the head well flexed on the chest. It will be found that stripping of the muscle attachments to the occipital bone on each side of the foramen magnum by means of a periosteal elevator greatly assists in giving an adequate exposure. The structures of the neck in this region are very deep and retraction of the muscles is best obtained by the Frazier spinal retractors. Freeing the muscle attachments to the occipital bone on each side of the midline permits a wide exposure of the wound. Care must be maintained not to disturb the muscle attachments along the superior curved line at the level of the occipital protuberance as final closure will be difficult if this attachment is freed. Bone wax will readily control bleeding from the bony sinuses and the Cushing silver clips make haemostasis rapid in the depths of the wound.

It has not been found necessary to rongeur the occipital bone above the foramen magnum. The posterior cervical roots readily present if the upper four laminæ are removed.

Absolute hemostasis is essential before opening the dura as the medullary region is exposed when the *cisterna magna* is opened with the dural incision. Hemorrhage in the posterior fossa may cause profound respiratory disturbance. There were no untoward postoperative symptoms in this small group of cases, but great care was taken to insure a bloodless field.

Ligation of the roots is to be preferred to section after destruction by crushing, because each root has a small artery which, if cut, may produce awkward bleeding. Hemorrhage encountered after the dura is opened is best controlled by a tiny muscle graft placed over the bleeding point and held in place for a few moments.

Irrigations with normal saline solution at 104 degrees will be found an excellent means of controlling the slight ooze from the cut muscle surfaces and insure a clean dry wound before the dura is incised. The use of cotton tampons along the sides of the wound will insure a dry field during the period in which the dura is open.

The absence of shock or untoward symptoms in this group of surgically poor risks is dependent upon careful conservation of blood by absolute hemostasis and the maintenance of a dry field throughout the operation. Local anesthesia is to be preferred in the initial stages of the operation, because of the assistance in control of early bleeding, if adrenalin is used with the novocain, 3 drops to the ounce of half per cent novocain solution. The tissue planes are more easily determined and it is important to carry the dissection directly in the midline and thus avoid the vascular muscle bed. If this is accomplished, the exposure may be made without the loss of more than an ounce of blood. During the freeing of the muscle attachments to the spinous processes, bleeding may be encountered and is best controlled by packing hot cotton tampons between the freed muscle surface and the spines. Two transverse veins are usually encountered as the foramen magnum is approached. These must be cut and ligated.

The lamina should be removed to the width of the canal on each side to assure ample room for securing the posterior roots as they converge laterally at their points of exit. A ligature is easily applied after they have reached the point of union.

A suction apparatus is of great value in keeping the field free from cerebrospinal fluid while the posterior roots are being tied. Careful closure of the dura by a continuous silk suture, well soaked in alcohol, will prevent the possibility of a cerebrospinal leak.

A fixation dressing to the neck in the form of a crinoline or plaster cast is an aid to rapid healing of the wound after operation.

DISCUSSION

Undoubtedly the group of patients with metastatic carcinoma of the neck present one of the most pathetic pictures with which the surgeon has to deal. Their suffering is intense and opiates are inadequate to control this pain.

A rapid loss of morale is added to the cachexia and discomforts of the disease, they present grave surgical risks, and hence are allowed to continue with the help of opiates as best they can. Certainly the results in Case 1 in which the patient was relieved of all pain and could return to work on his farm for 6 months, is in contrast to the usual course pursued by patients with carcinoma which has reached the stage at which pain from the growth deprives them of sleep and rest sufficient to carry on their pursuits for the little time remaining to them. Following operation Case 2 obtained the first relief of pain he had experienced in 4 months and could hardly express the gratitude he felt. He slept soundly without the need of morphine and made a rapid surgical recovery. About 6 weeks following the operation, the patient developed enophthalmos, slight ptosis and a myosis on the right side. With this came pain deep in the neck behind the ear and referred to the right cheek. It was constant, dull, aching in character and not sharp and shooting like his former pain, and it was not referred to the vertex. It was felt, in view of the persistent cervical anesthesia that the growth had extended to the superior cervical sympathetic trunk, and the pain was sympathetic in origin. Case 3 was painfree up to the time of death, 2 months after operation. A sudden pulmonary edema proved fatal. There was a reference of pain into the mandibular nerve, due to extension around the ramus of the jaw. This was partly controlled by alcoholic injection, the patient being too weak for section of the posterior root of the fifth nerve to be attempted.

Rhizotomy was first suggested by Dana, and practiced on a large group of patients by Foerster as a means of relief of pain in tabes and for spasticity of the lower extremities. Its application has been largely confined to the dorsal and lumbar cord. Keen's operation for spasmodic torticollis, applies to the extra vertebral branches, in their supply to the muscles of the neck. The intradural method of destroying the pain fibers, as they enter the cervical cord is a new application of rhizotomy, by the author, for the relief

of pain caused by metastatic invasion of carcinoma to the deep structures of the neck. It offers the logical means of solution of continuity of nerves in the cervical region where blocking is impracticable or it is feared that the exposing of an involved nerve in the region of new growth may be difficult, because the field is a very vascular one and further dissemination of the neoplasm may follow.

CONCLUSIONS

I. A means of relief from pain due to involvement of the superficial cervicle nerves by meta-

static carcinoma is offered and 3 cases of cervical rhizotomy reported.

2. The upper three posterior cervical roots were crushed and ligated without untoward symptoms or shock in patients who were considered poor surgical risks.

3. Complete relief of cervical pain was obtained in all three cases. A recurrence of pain of a different character occurred in one case, 2 months after operation, associated with sympathetic paralysis, and was thought to be due to involvement of the cervical sympathetics by further extension of the growth.

ENTEROSTOMY—ITS SURGICAL IMPORTANCE¹

By CLARK D. BROOKS, M.D., F.A.C.S., WILLIAM R. CLINTON, M.D., F.A.C.S., AND L. BYRON ASHLEY, M.D., F.A.C.S., DETROIT, MICHIGAN

THERE is probably no more important surgical measure in certain types of cases than enterostomy. It is usually a life saving procedure and through it we have greatly reduced our mortality in cases of acute intestinal obstruction or severe general peritonitis.

In reviewing the history of enterostomy we find that Renault in 1772 was the first surgeon to perform this operation using it with successful results in a case of intestinal obstruction following strangulated hernia. The advisability of an enterostomy in intestinal obstruction and its successful use in several cases is mentioned in the writings of French surgeons in the first half of the eighteenth century. Nelaton in 1858 performed an enterostomy at the ileum with good results using an incision in the right iliac region opening the first loop of intestine that presented and suturing it into the wound. This technique was used for some time and was improved by the use of a tube sutured in the bowel and later by Witzel's method in which a catheter was made to enter the bowel obliquely and the wall of the bowel was infolded over it.

In recent years Victor Bonney has advocated an enterostomy in the jejunum in cases of acute intestinal obstruction and McKenna the same procedure for the relief of ileus. Other writers have advised that the enterostomy be made at the ileum or cæcum.

Enterostomy in all cases is designed to drain the bowel to relieve gaseous distention or to aid in the insertion of solution into the bowel.

It is the authors' purpose in this paper to urge more primary enterostomies and earlier enterostomies. There is practically no surgical measure attended with so little danger and followed by such wonderful results.

An enterostomy is indicated in severe cases of ruptured appendix with peritonitis, in intestinal obstruction postoperative ileus traumatic peritonitis, peritonitis due to a ruptured viscus or perforated bowel pneumococcal and streptococcal peritonitis, and in certain cases of anastomosis or resection of the stomach or bowel. The only contra indication we know of is the presence of tuberculous peritonitis.

In bad cases of ruptured appendix with peritonitis, we have for some years made a practice of doing an enterostomy or cæcostomy at the time of operation. If the peritonitis is fairly well localized we do a cæcostomy or appendicostomy that is we insert a catheter into the cæcum through the base of the appendix. In severe cases with diffuse peritonitis we do an enterostomy at the ileum and in others we do both cæcostomy and ileostomy. In most of these cases because of the peritonitis an ileus is present at the time of operation, and we are sure that the use of a primary enterostomy at this time has reduced our mortality more than 50 per cent.

Most surgeons will agree that after operation in certain types of delayed appendicitis with local or general peritonitis, when drainage of the peritoneal cavity has been instituted the patients often do fairly well for a day or two and then

have more pain and usually a rise of temperature with increased pulse rate, distention, and vomiting. This means a spreading peritonitis or ileus. Whatever the cause the treatment is the same.

If after one or two gastric lavages, the distention is not relieved, and the color of the contents of the stomach does not improve, an enterostomy should be performed without delay.

We have been surprised in many cases of this type, when patients apparently moribund, with cold extremities, rapid pulse, and delirium, have recovered from what seemed inevitable death. In a considerable number of these cases, it has not been necessary to use even a local anæsthetic, the condition of the patient being so serious. The sutures may be removed from the wound and usually a distended loop can easily be picked up by the finger if it does not present itself, and the distended loop punctured with a small knife. Sometimes, we have made multiple punctures, four or five in different loops of the bowel, and one would hardly believe, without experience in such cases, what an amount of fecal like material is retained in such distended loops. We also note that when these loops of bowel drain well, the prospect of recovery is much greater. In some cases of streptococcic peritonitis there will be improvement, and often recovery, even after a number of the loops are collapsed because of the extensive exudate. It is important that along with enterostomy, supportive treatment be given.

In cases of acute intestinal obstruction, many patients are sent in for operation in a very serious condition due in many cases to delayed diagnosis. The physician is not always at fault in these cases, as sometimes he is not called until the obstruction has been present for several days, or patients may refuse operation until the condition has become serious. In all such cases, primary or postoperative, there is no more important factor than that of early diagnosis, and it should be remembered that the mortality rate increases rapidly with delay.

The symptoms of colic like abdominal pain, nausea, and vomiting, constipation, obstipation, and abdominal distention not relieved by simple methods within 24 hours usually mean obstruction of the bowel or postoperative ileus. This diagnosis should be assumed to be correct until proved otherwise. Then treatment should not be delayed, as these are the cases in which large areas of the bowel are found to be gangrenous. It is in these delayed cases of obstruction, whether acute or chronic, that enterostomy is of the utmost value. The operation may easily be per-

formed with local anæsthesia, and patients who are in desperate condition with cold extremities, rapid pulse, dyspnoea and collapse, may have, if necessary, an enterostomy performed without even being removed to the operating room. The immediate relief often seems miraculous. In addition to serving as a drain for the toxic fecal content which is killing the patient, the enterostomy may be used for the purpose of giving saline and glucose solution, which is often of life saving importance.

It is not necessary in these moribund cases to make an extended search for the site of the strangulation, but it is best to be satisfied with a small enterostomy in the first distended loop of bowel which presents itself. A very small incision is sufficient, and later, after the patient's condition has improved, whether in a few days or a week or more, the second stage of bowel resection can be safely performed.

Orr and others have proved by experimentation that there is a decrease in blood chlorides in cases of intestinal obstruction and an increase of blood urea. Therefore it is most important that saline be given to these patients in large amounts. We cannot depend upon saline by rectum, but by hypodermoclysis, the needles being left *in situ* and from 100 to 200 cubic centimeters of solution allowed to run in every hour or two. By this method we know exactly what the patient is getting, and the amount can be increased or decreased according to the needs of the case, and not left to guess work.

In certain cases, we also use saline intravenously, but we usually prefer to give the saline by hypodermoclysis and use the veins for a 5 or 10 per cent glucose solution, 300 to 500 cubic centimeters being given daily for a few days.

These patients are always cold because of toxæmia and should be surrounded by hot water bags or hot packs placed around the extremities and over the liver and chest. Morphine and atropine should be given freely. Having the advantage of a perfectly functioning enterostomy, they may also have large quantities of fluids, especially hot fluids, such as coffee, etc. It will be found that the mortality will be greatly decreased if these methods are followed.

In most surgical clinics, the one stage operation for resection of the colon for any cause has been discontinued because the two-stage operation is much safer. In spite of the most elaborate technique and the utmost care, infection follows the one-stage operation in more than 50 per cent of cases, with a correspondingly high mortality rate. Infection can be practically eliminated by making



FIG. 1 Technique of enterostomy

a preliminary temporary enterostomy or an enterostomy above the line of resection

In cases in which the condition is bad and a good deal of obstruction is present the preliminary temporary enterostomy should be done about a



FIG. 2 Enterostomy through stab wound site of enterostomy covered with omentum

week or 10 days before the operation for resection. In obstruction of the descending colon and rectum appendicostomy and cecostomy are very satisfactory methods. There is much less shock

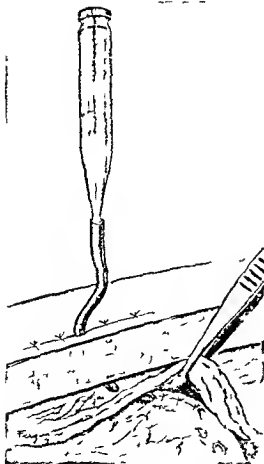


FIG. 3 Technique of insertion of fluid

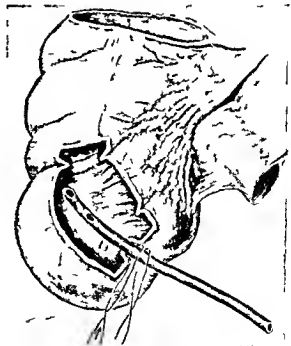


FIG. 4 Technique of cecostomy

attending extensive resection of the colon after such a temporary enterostomy

Much of the secondary anemia accompanying ulceration and obstruction we believe to be due to the absorption of secondary bacterial poisons rather than to the growth of the neoplasm itself. After this type of an operation, patients who have not been able to eat satisfactorily without pain, distress, and vomiting, and who suffer from constipation, dry skin, and a rough, sore tongue, take on a new lease of life following the free administration of suitable fluids and food.

In cases of diverticulitis, especially when the diverticulum of the sigmoid is ruptured, enterostomy may be the only safe procedure because it side tracks the fecal current and gives the ruptured diverticulum a chance to heal.

TABLE I—RESULTS OF OPERATION PERFORMED BY US IN 378 CASES OF PERFORATED APPENDIX WITH DIFFUSE PERITONITIS DURING LAST 5 YEARS

	Cases	Recovered	Died
Enterostomy ¹	20	11	9
Cæcostomy ¹	26	24	2
Enterostomy and cæcostomy	15	0	6
	61	44	17

¹ Enterostomy or cæcostomy in 61 cases or 16 per cent

TABLE II—RESULTS OF ENTEROSTOMY IN 85 CASES

	Cases	Recovered	Died
Postoperative ileus	33	17	16
Intestinal obstruction	32	19	13
After resection or anastomosis	6	6	0
Traumatic peritonitis with ruptured bowel	3	0	3
Perforated bowel with peritonitis	3	1	2
Ruptured pus tubes with peritonitis	3	2	1
Perforated gastric ulcer with peritonitis	1	0	1
Pneumococcal peritonitis		1	1
Streptococcal peritonitis		1	1

TABLE III—RESUME OF 145 CASES

Perforated appendix with peritonitis	61
Postoperative ileus and obstruction	33
Acute intestinal obstruction	32
Proximal to resection or anastomosis	6
Traumatic peritonitis with ruptured bowel	3
Perforated bowel with peritonitis	3
Ruptured pus tubes with peritonitis	2
Perforated gastric ulcer with peritonitis	1
Pneumococcal peritonitis	2
Streptococcal peritonitis	2

Enterostomy is also of the greatest value in infants with congenital defects in the rectum and anus. In infants a day or two old, operation to establish an opening of the rectum without an enterostomy is usually followed by death, but an enterostomy can easily be done on these small patients with almost no shock and no attending mortality. Later, when the condition is improved, whatever operative procedure seems desirable can be followed. This is also the case in Hirschsprung's disease, and in certain cases of rectovesical and rectourethral fistula of traumatic origin, but it may rarely be used in cases of fecal obstruction in very old people.

We have used enterostomy in numerous cases of traumatic peritonitis, and peritonitis due to stab wounds and gun shot wounds, with very good results. The enterostomy is made above the perforated or lacerated bowel.

Often in cases of severe pelvic peritonitis or of general peritonitis due to ruptured pus tubes, an enterostomy will give good results. We did an enterostomy in 2 cases of streptococcal peritonitis with recovery in 1 case.

TECHNIQUE

The technique varies with the case at hand, from the mere re opening of the patient's wound in the late cases and puncture of one or more loops of distended bowel followed by insertion of one or two cigarette drains, to the classical Witzel or Coffey enterostomy. We prefer to perform the Witzel enterostomy as follows.

A suitable loop is selected and its contents gently expressed. The assistant either holds both ends firmly with the fingers or applies lightly a rubber clamp or clamps. Then a purse string suture is placed opposite the mesenteric border. Traction is applied to this suture as is done in inverting an appendix stump. The intestine is then incised and the No. 10 or No. 12 rubber catheter with fenestrations is inserted for a distance of from 1 to 2 inches. The purse string suture is tied and the tube sutured with the same stitch. The catheter is then depressed along the intestine and several Lembert sutures are inserted which unite the serosa over the tube from 1 to 2 inches. If the omentum presents readily, the free end of the catheter is passed through an opening in it. The catheter may be withdrawn through the original incision or through a stab wound.

The catheter may be allowed to drain out on the flank. This procedure will decrease the distention of the abdomen and facilitate the closure. If the drainage is not free, simple irrigation will probably start it.

The glass tube of a bulb syringe or a small funnel is fitted into the free end of the catheter for convenience in pouring in the water, saline, or glucose.

Occasionally if the first enterostomy does not drain at once it is advisable to do a second one higher up in the intestinal canal. Either one of these may be connected with a long tube filled with water which is lowered so that it will syphon off the toxic fecal content.

We frequently do a primary cecostomy through the stump of the appendix after the appendix has been removed in the usual way, opening the base end, passing the catheter through into the cæcum, placing two purse string sutures about the base of the appendix in the caput cæcum, and inverting the stump as in cholecystostomy.

Colostomy is a valuable procedure. It may be temporary or permanent according to the judgment of the surgeon in the case at hand.

The technique of permanent colostomy is well known to all but we wish to emphasize the importance of elevating the bowel well out of the wound and suturing it there as this procedure will lessen the chance of peritonitis, fistula, drainage, etc.

AFTER-TREATMENT

Let us emphasize that we have a dehydrated, starved and toxic patient. Therefore he should have fluid and food by mouth, by bowel, subcutaneously and intravenously with gastric lavage at frequent intervals or until the fluid obtained is clear.

The solution suggested by Dr. Titus at a recent meeting: $1\frac{1}{2}$ ounces lactose, $2\frac{1}{2}$ drams of soda bicarbonate in a pint of water should be given at frequent intervals during the day.

Five hundred cubic centimeters of saline or 5 to 10 per cent glucose solution by hypodermoclysis should be given at once, and 100 cubic centimeters every hour.

Rectal drip or enema of glucose and soda and tap water is given every 4 to 6 hours.

From 300 to 500 cubic centimeters of a 10 or 25 per cent solution of glucose are given every 4 to 6 hours. Saline is used if glucose solutions are not at hand.

From 3 to 6 ounces of 25 per cent glucose and saline solution is instilled into the enterostomy tube every hour.

A daily enema is given.

Carbohydrate foods are administered as soon as the stomach will retain them.

The catheter will usually loosen and can be readily withdrawn on the sixth to the eighth day. There may be some fecal discharge for a day or two, but when enterostomy is carefully done by the method described, healing usually takes place spontaneously, and a secondary closure will rarely be necessary.

We wish at this time to pay tribute to the necessary team work of the nurse and the house physician in such cases. The success of the measures instituted will depend upon painstaking care in carrying out all details.

BIBLIOGRAPHY

1. PENALTY. Quoted by Summers.
2. NÉLATON. Quoted by Summers.
3. BONNEY V. On postoperative paralytic obstruction of the intestine with special reference to its treatment by jejunostomy. *Arch. Middlesex Hosp.* 1910 xii 37-44.
4. HENDLEY W. S. Ileus duplex (inflammatory enterocolic ileus). *Lancet* 1915 i 900-906.
5. McKERNAN HUGH. Drainage of the upper intestinal loop for relief of ileus based upon eight clinical cases successfully operated upon and animal experimentation. *Surg. Gynec. & Obst.* 1913 viii 674.
6. STILES SIR H. The value of cecostomy in the treatment of malignant disease of the colon. *Brit. J. Surg.* 1921 ix 1-3.
7. DOWD C. N. Enterotomy for ileus. *Ann. Surg.* 1917 lxxv 92-104.
8. SUMMERS J. L. Enterostomy in the treatment of acute intestinal obstruction. *Surg. Gynec. & Obst.* 1921 xxvii 41-414.
9. JUDD I. STARR and RAYMOND I. REED W. Ileostomy following resection of the colon. *Surg. Gynec. & Obst.* 1922 xxvii 30.

CANCER OF THE MOUTH THE RESULTS OF TREATMENT BY OPERATION AND RADIATION

A STUDY OF THREE HUNDRED SEVENTY-SIX CASES OBSERVED AT THE MASSACHUSETTS GENERAL AND COLLIS P. HUNTINGTON MEMORIAL HOSPITALS IN THE THREE YEAR PERIOD, 1918-1920¹

BY CHANNING C. SIMMONS, M.D., F.A.C.S., BOSTON

IN 1922 the American College of Surgeons appointed a committee to study the cancer situation as it recognized that the statistics in regard to the results of the various forms of treatment left much to be desired and that it was impossible in many instances to compare the statistics of the results of treatment as given in one communication, with those of another. This committee adopted a form card for the history, treatment and result, which was furnished to the different clinics in order that the cases should be reported in uniform manner. It was determined to study cancer of the cervix, breast, and mouth, treated surgically and by radiation. The report on the results of the treatment of cancer of the cervix was published in July, 1924 (1), and represents the combined results from twenty-two clinics.

The following is a report of the cases of cancer of the mouth seen at the Massachusetts General Hospital and the Collis P. Huntington Memorial Hospital during the three year period, 1918-1920. The records of the patients were abstracted on cards provided by the American College of Surgeons by Dr. William M. Shedden and Dr. Edwin P. Hayden to whom the author wishes to express his appreciation for their assistance not only in abstracting the records, but in investigating the end results. I wish also to thank Dr. H. T. Hartwell, clinical pathologist of the Massachusetts General Hospital, and Dr. W. L. McNamara of the Huntington Hospital and the Harvard Medical School for their aid in the pathological study. The end results are known in 91 per cent of the cases.

The cases were treated surgically, by radiation and by a combination of the two methods. In this report the term "cure" is applied to cases living without evidence of disease three or more years after treatment. In every case of "cure" by operation the diagnosis was confirmed by a microscopic examination of the tissue. It was found impossible to obtain a biopsy on every case treated by radiation, as it caused the patient undue suffering and there was the risk of possible dissemination of the growth, but in most cases

the diagnosis has been confirmed by the progress of the disease while in the "cured" cases if no specimen was available, the fact was noted.

Three hundred and seventy-six cases were admitted to the two institutions during the three year period under consideration as follows: Huntington Hospital, 278, Massachusetts General Hospital, 20, both institutions, 78. The cases were divided into definite groups according to the classification given on the card furnished by the American College of Surgeons. This classification distinguishes chiefly between the primary cases and cases of recurrence, either local or glandular, after operation. The primary cases are subdivided into those with and without glandular involvement. Primary cases without glandular involvement are those commonly considered favorable cases for cure.

ETIOLOGY

No new facts in etiology were brought out by the study of these cases. Eighty-seven and one-half per cent were males and 12.5 per cent females. Chronic irritation in some form was mentioned as an etiological factor in a large percentage of the cases. Eighty-five per cent used tobacco in some form. Most of these smoked, while some chewed and a few used it as snuff. It was not uncommon to find cancer of the cheek developing on the side of the mouth on which the quid was held.

Leucoplakia was noted as present in 14 per cent. The Wassermann test was reported in 184 instances and was positive in 30 or 16 per cent.

Data as to the condition of the teeth were obtainable in 154 cases. In 126 they were described as bad and in 28 cases patient dated his first symptoms from the irritation of a false tooth plate or bridge. One patient gave as an etiological factor a cut from the pipe stem and another, a cobbler, who was in the habit of holding nails under the tip of his tongue, developed cancer at this point.

The duration of the disease from the onset to the first consultation with a physician, was relatively short.

¹From the Cancer Commission of Harvard University.

TABLE I—AVERAGE DURATION—
PRIMARY CASES

	Months
Glands not infected	4
Glands infected	6
Cures	7

It is seen that in the cases which were cured, the duration was distinctly longer than the average which may be interpreted to mean that the slowly growing form of cancer is most amenable to treatment.

Delay from the onset of the disease to the first consultation with physician is shown in the following table

TABLE II—DELAY FIRST SYMPTOMS TO FIRST
CONSULTATION

	Per cent
Less than 1 month (no delay)	40
One to 3 months	27
Over 4 months	33

Of the primary cases 76 or 24 per cent are definitely known to have received poor advice from the first physician consulted. This implies that the physician or dentist did not recognize the disease and valuable time was lost in instituting proper treatment. Of these 76 men, 67 were physicians and 9 were dentists.

PRIMARY CASES

The most important group to be considered is the primary cases, 318 in number. These are cases in which no active treatment had been employed prior to the consultation at the hospital. Seventy-one per cent of these cases presented clinical evidence of metastases when first seen. This implies that the outlook for cure, considering all the primary cases is poor for of the 29 per cent of primary cases without clinical evidence of metastases 35 per cent are cured, which represents only 10 per cent of all primary cases.

DEFINITION OF TERMS EMPLOYED

Radical operation. By this is meant the two-stage operation. In cases of cancer of the tongue, floor of the mouth, cheek, and in a few instances cancer of the alveolar process at the first operation the growth was removed by the intrabuccal method followed by cauterization of the raw area by the actual cautery, a small jeweller's soldering iron being usually employed. The cheek was split if necessary to give good access to the growth. Total or partial excision of the upper and lower jaws was done in the classical manner. Approximately 10 days later, a radical neck dis-

section was performed and the internal jugular vein, the sternomastoid muscle, and all the glands from the omohyoid muscle to the base of the skull and symphysis of the jaw removed. The glands were not removed from both sides in any case in this series.

Incomplete operation. By this is meant intra-buccal excision of the growth and cauterization without gland dissection. The operation was done in very early cases in cases which were poor surgical risks, and in a few instances in which permanent cure was not expected but in which it was possible to remove all the local growth.

Radiation treatment. The methods of radiation employed were so varied that it was found impossible to draw conclusions from the small numbers falling in each group. The local growth was in most instances treated by the introduction of 'seeds' of radium emanation. The 'seeds' are small glass tubes containing from 1 to 5 millicuries of emanation. These tubes were introduced into the growth where they were allowed to remain, and for each seed introduced the patient received 132 millicurie hours treatment of unfiltered radiation. In some instances surface application of radium was employed with a varied amount of screening. The glandular areas of the neck were treated either with radium 'packs,' or with short, or moderately long wave length X ray. It was found necessary to judge each case receiving radiation treatment separately and to decide arbitrarily as to whether or not it had received what might be called sufficient radiation treatment to accomplish results.

The tables have been much condensed in order to make them clear. An apparent discrepancy in figures may be noticed but I believe that all these have been accounted for in the original tables and are not due to error.

RESULTS OF OPERATIVE TREATMENT

The results of the 51 operations on the primary cases that showed no clinical evidence of metastases are as follows: there was one operative death, a mortality of 2 per cent. The end result could not be determined in one case and four others died of other causes without evidence of disease within 3 years, and have been excluded. Radical operations were performed in 18 cases and incomplete operations in 33. The results are shown in Table III.

That the results following radical operations are practically the same as those following in complete operations is probably due to the fact that the incomplete operation was performed on

TABLE III—RESULTS OF OPERATIONS (45 CASES) IN PRIMARY CASES WITHOUT CLINICAL METASTASES

	Dead	3 year cures	Per cent cures
Tongue	15	4	26
Floor	3	1	5
Cheek	2	4	66
Upper jaw	4	4	50
Lower jaw	4	3	43
Tonsil	1	0	0
Totals	29	16	34.7
'Cures' following radical operation			35 per cent
'Cures' following incomplete operation			35 per cent
Operative mortality (1 case in 51 operations)			2 per cent

many early cases in which it was not deemed necessary to perform a neck dissection

The variation in malignancy of the diseases in different situations in the mouth is also shown in Table III. The percentage of cures of cancer of the buccal mucosa of the cheek and upper jaw is very much greater than that of cancer of the floor of the mouth and tongue. Cancer of the upper jaw arising in the antrum is not included in this report. The impression was that the papillary slowly growing form of cancer was more common on the upper jaw and cheek.

The results following surgical intervention in primary cases which showed clinical evidence of metastases are not encouraging. There are 25 cases in this group. Of these 25 cases 2 died as a result of operation, an operative mortality of 8 per cent, and 2 were not traced. Incomplete operations were performed on 10 cases with no cures, as would be expected. A radical operation was performed on 13 with 1 cure.

TABLE IV—RESULTS OF OPERATIONS IN PRIMARY CASES WITH CLINICAL METASTASES

Incomplete operations	10	no cures
Radical operations	13	1 cure
Operative mortality		8 per cent

The one case in this group cured was a carcinoma of the tonsil with a metastasis into the tonsillar lymph gland.

Many of the cases were referred to the X ray department following operation for postoperative prophylactic X ray treatment, but in checking up the results it was found that many patients did not report regularly and some not at all. In only five instances was what might be termed sufficient prophylactic X ray treatment given. All of these cases are dead.

An attempt was made to determine in how many instances the glands proved to be cancerous after removal when present clinically. The results are shown in Table V.

TABLE V—METASTATIC GLANDS—CLINICAL DATA AND PATHOLOGICAL CHECK

Glands clinically palpable, 16 cases	
Proved cancer	7
Proved not cancer	9
No glands palpable, 9 cases	
Proved cancer	2
Proved not cancer	7

It is seen that when glands were present less than one half proved on pathological examination to be cancer and in cases in which no glands were palpable, about 25 per cent showed microscopic evidence of disease at operation. It was found to be impossible to determine with any accuracy the site of recurrence after operation as many with local recurrence did not report until it was advanced and it was impossible to say if the glands in the neck were secondary to the primary growth or to the recurrence. In a few instances the latter fact was known to be the case. In many other cases the outcome was determined by letters from friends or relatives who only stated the patient had died of a recurrence of the disease. There was one case of remote recurrence—a case of cancer of the upper jaw which at autopsy showed metastases in the lungs, vertebrae, and ilium. All of the others as far as is known recurred locally or in the glands above the clavicle.

Results following radiation treatment. The results of operation upon primary cases are to be compared with the similar group of cases treated by radiation. There were 27 primary cases that showed no evidence of metastases which were treated with radium and X ray with no immediate mortality. There were four "cures"—15 per cent. No pathological examination was made in any of the cured cases. All were of the papillary type and originated in areas of leucoplakia, and the diagnosis of malignancy is open to question. One had a distinct indurated area and was undoubtedly malignant. The other three cases received many radium treatments for recurring areas of papilloma and leucoplakia over a long period of time.

One hundred and eight primary cases in which the glands were clinically malignant were treated by radiation. There were no cures. It is, perhaps, hardly fair to consider all of these 108 cases comparable to the 25 in the corresponding group

treated by operation. In all the operative cases, some hope was entertained of removing all the disease while certain of the cases treated with radiation were hopeless and the treatment was given only as a palliative measure. On the other hand many of the advanced cases had insufficient treatment and are therefore not included in this group. The results of radiation treatment are shown in the following table:

TABLE VI—RADIATION TREATMENT

Primary cases—glands not malignant	27 cases	4 cures
(15 per cent)		
All papillary type with leucoplakia		
Many treatments in 3 cases		
One treatment in 1 case		
No pathological examination of tissue		
Primary cases—glands cancerous	108 cases	Cures none

Comparing these two similar groups of cases the first treated by operation and the second by radiation it is seen that in primary cases of cancer of the mouth without evidence of metastases surgical treatment offers 35 per cent chances of cure, the operative deaths being classed as failures against at best 15 per cent of cures following radiation treatment. In primary cases with evidence of metastases radiation treatment offers no chance of cure and operation not over 5 per cent.

Disregarding the question of cure the cases of death from disease were studied to determine if life was prolonged by any form of treatment with results shown in the following table:

TABLE VII—LENGTH OF LIFE AFTER TREATMENT—CASES OF DEATH FROM DISEASE

	Months
Primary cases—glands not malignant	
Following operation (29 cases)	20
Following radiation (23 cases)	15
No treatment (12 cases)	8
Primary cases—glands cancerous	
Following operation (22 cases)	10
Following radiation (108 cases)	6 6
No treatment (55 cases)	4 5

It is seen in comparing groups of similar cases that the life was distinctly prolonged by treatment. Patients live longer following surgical operation than following radiation treatment in both groups those with and without metastatic glands. The amount of discomfort following the two methods of treatment is very difficult to determine but I am inclined to believe that the total amount of discomfort following radium treatment of cancer of the mouth is much greater than that following operation, although the

immediate discomfort after a surgical operation is of course great.

Prolongation of life by radiation treatment is also seen in the primary cases which recurred following operation. The average length of life in the recurrent group treated by radiation was 17 months while in the cases not radiated it was 15 months.

TABLE VIII—EFFECT OF RADIATION ON RECURRENCE

Average length of life after radiation	
Radiation treatment of recurrence	Mo this 17
No radiation treatment of recurrence	15

CASES RECURRENT AFTER OPERATION PERFORMED ELSEWHERE

There were 45 cases in this group of cases recurrent after operation performed elsewhere which may be divided as in Table IX.

TABLE IX—RECURRENT CASES

	Cases
After radical operation	
Local only	1
Glandular only	2
Local and glandular	13
After incomplete operation	
Local only	9
Glandular only	2
Local and glandular	13

It is seen that there was a local recurrence in 41 out of 45 cases, that is in only 4 was the primary growth successfully removed. The character and extent of the original growth is not known in any of these cases but in many the operation performed was obviously inadequate so that it was impossible to say, in the cases in which there was both local and glandular recurrence, if the glands were secondary to the original growth or to the local recurrence.

The recurrence as a rule took place early. The average time of recurrence following incomplete operation was 2 months, following radical operation 4½ months.

The final result is known in 40 of the 45 cases. One is living and the other 39 are dead. The 'cured' case was one of so-called local recurrence following an incomplete operation for a small cancer of the tongue. When he was seen at the clinic, 3 weeks after operation there was induration about the wound but it was impossible to say whether or not this was a postoperative inflammation or a tumor. He received three radium treatments and was living 4 years later. The

TABLE X—PROLONGATION OF LIFE BY RADIATION TREATMENT

	Months
Average life radiated cases	10.7
Average life cases not radiated	7

recurrent cases that received radiation treatment as a palliative measure lived 3.7 months longer from the date of observation than the cases not treated

RE OCCURRENCE

By re occurrence is meant a new carcinoma arising from the buccal mucosa at some distance from the point from which a previous growth has been removed and obviously having no relation to it. The cases are of particular interest and are comparable in some ways to the multiple keratoses and carcinomata of the skin. There were 16 cases in this group, 3 of which are also included in the group of primary cases.

Leucoplakia was present in 8 out of 10 of the cases in which its presence or absence was mentioned. The average length of time after operation at which the second growth occurred was 7 years. In no case were the glands of the neck involved until the second local growth had reached a large size.

Of the 16 cases, 5 were operated upon with no cures, 8 received radiation treatment with one cure, and 3 received no treatment.

The "cure" was a case of cancer of the tongue occurring near the scar of operation for cancer performed 5 years previously. The clinical diagnosis was beyond question. A seed containing 5 millicuries of emanation was introduced, and the patient suffered intensely for 6 weeks but is now well 5 years later.

PATHOLOGY

In the light of recent studies we are led to believe that the results of the treatment of cancer depend more on the malignancy of the growth as determined by the amount of differentiation of the cells than on any other one factor. In 1920 Broders (2) reported a series of cases of cancer of the lip from the Mayo Clinic and divided them into four groups according to the amount of differentiation of the cells. He placed in Group 1 those cases in which there was much differentiation and keratinization, and in Group 4, those in which there was no tendency to differentiate and the cells infiltrated the deeper structures. MacCarty has since made several communications on this subject. Greenough (3) has shown the same to be true in cancer of the breast. In 1922 I reported, with Dr. E. M. Deland (4), a

series of cases of cancer of the lip from the Massachusetts General Hospital Clinic and classified them according to Broders' standard, dividing them, however, into three instead of four groups. The results were similar to those of Broders and are shown in Table XI.

TABLE XI—CANCER OF THE LIP, RESULTS OF OPERATION, PATHOLOGICAL GROUPING

	Living Cases	Per Cent	Dead Cases
Group 1	53	81.5	12
Group 2	14	70	6
Group 3	4	22	14

In other words the more the epithelial cell departs from the normal the more malignant the tumor. This is simply the application to the clinical case of a fact long known in the laboratory, and the surgeon today should not be satisfied with the diagnosis of cancer but should insist that the pathologist give some opinion as to the degree of malignancy.

In this series of cases of cancer of the buccal mucosa, specimens from 71 were available for review but 59 cases only were suitable for study. Twelve cases were either operative deaths, died of other disease, or were not traced.

The specimens from these cases were reviewed by me and divided into four groups representing different degrees of malignancy. All of these cases are, of course, squamous cell carcinoma. The criteria for the grouping was (1) differentiation of the cells and keratinization, (2) irregularity in the size and shape of the nuclei, (3) tendency to deep infiltration, and (4) mitotic figures. In Group 1 were placed those cases in which the cells were highly differentiated and showed little tendency to infiltrate, and in Group 4, cases showing cells with little tendency to differentiate but to infiltrate deeply. The slides were then reviewed by Dr. H. F. Hartwell and W. L. McNamara, who also separated them into groups, and the results compared. It was found that our opinion as to the malignancy agreed closely in nearly every case. Certain of the cases in Group 1 were papillomatous but all have been considered cancer by Dr. J. H. Wright and certain of the doubtful cases have since died of metastases. The cases were then separated into groups according to the degree of malignancy as shown by the specimen and it was found that cases placed in Group 1 showed 68 per cent of cures while there were no cures in Group 4. It must be remembered that the duration and extent of the disease and the type of operation performed have been disregarded (Table XII).

TABLE VII—RESULTS OF OPERATION, PATHOLOGICAL GROUPING

	Cases	Cures	Per Cent
Group 1	27	12	68
Group 2	14	3	21
Group 3	17	7	6
Group 4	11	0	0

The type of operation performed apparently made little difference in the result the cases in Group 1 recovered while those in Group 4 died

TABLE VIII—RESULTS OF OPERATION, CASES DIVIDED INTO PATHOLOGICAL GROUPS

Incomplete Operations			
	Cases	Cures	Per Cent
Group 1	15	10	66
Group 2	8	2	25
Group 3	7	1	14
Group 4	0	0	0

Radical Operations			
	Cases	Cures	Per Cent
Group 1	2	2	100
Group 2	6	1	16
Group 3	10	0	0
Group 4	5	0	0

I believe that the cases should be grouped pathologically as to their malignancy in any report of the results of a given method of treatment of cancer as it is manifestly unfair to compare statistics of an observer who has been unfortunate enough to have had a large percentage of Group 4 cases with those of a man who has had chiefly cases falling into Group 1

SUMMARY

1 Cancer of the buccal mucosa is a rapidly growing form of carcinoma and is often incurable in a few months from the onset of the disease

2 In primary cases without clinical evidence of metastases surgical treatment offers 35 per cent chances of permanent cure as against 15 per cent by radiation treatment

3 In primary cases with clinical evidence of metastases, radiation treatment offers no chance of permanent cure and radical surgical treatment not over 5 per cent

4 The degree of malignancy varies somewhat as to the situation cancer of the cheek and upper jaw being less malignant than cancer of the tongue or floor of the mouth This is probably due to the fact that the papillary type is more common in the former positions

5 In the early cases, comparatively little reliance as to metastases can be placed on the presence or absence of palpable glands

6 Of the primary cases dying of a recurrence of the disease, life is prolonged by treatment but the patient lives longer following operative treatment than following radiation treatment

7 In recurrent cases dying of the disease, in all groups life is longer in the cases which received radiation treatment than in those cases receiving no treatment

8 A certain group of cases which may be said to have been cured by treatment are prone to develop a second cancer at some other point in the buccal mucosa

9 The results of treatment depend more on the amount of differentiation of the cells as determined by the microscopic examination of the specimen than on any other one factor

REFERENCES

- 1 Surg Gynec & Obst 1924 xlii 18
- 2 J Am M Ass 1920 Mar 6
- 3 South M J 1925 xviii 9
- 4 Surg Gynec & Obst 1922 xxvi 756

LATERAL CYSTOGRAMS

A STUDY OF THEIR CLINICAL IMPORTANCE

By W. E. COUTTS SANTIAGO, CHILE

University Clinic Section of Urology

CYSTOGRAPHY is not by any means a new method. Since 1906, when Voelcker and Lichtenberg (1) obtained an opaque cystogram, many surgeons have used the method with clinical success. Cystography has not come to be so important as pyelography because the bladder can usually be studied with the naked eye through the cystoscope.

Recently, however, a new field was opened for this method, when Dariaux, Blanc and Negro presented their work before the Societe de Radiologie Medicale, March 10, 1925. They showed cystograms taken in a lateral position and called attention to the great importance of obtaining plates of the bladder with the patient in dorsal and lateral positions.

These facts were pointed out in an isolated case published as far back as 1912 by W. Lerche (2) of Minnesota. In some way this first effort to obtain a lateral cystogram in a case of diverticula of the bladder was not awarded due recognition, as in current medical literature we find no record of further experiences on the subject.



Fig 1 Anteroposterior cystogram of normal bladder containing 80 cubic centimeters of opaque solution. This view shows the flattening of the dome.



Fig 2 Lateral view of same bladder as in Figure 1



Fig 3 Anteroposterior cystogram of normal bladder containing over 200 cubic centimeters of the opaque solution.



Fig 4 Lateral view of same bladder as that in Figure 3

In 1922 Sgatzter Eisler Blum and others published some work on cystoradioscopy in the lateral position with studies of the movements during micturition of normal and diseased bladders. Not until 1925 did the French specialists begin the use of lateral cystography when Marion



Fig 5 Prostatic hypertrophy. Bladder containing over 220 cubic centimeters of 10 per cent sodium bromide solution

and his collaborators discussed the subject in scientific meetings and published papers on it.

The method is very simple in fact the same as that used in ordinary dorsal cystography. The patient is placed on his side on a table inclined 35 to 40 degrees. When the patient is in this position the shadow of the bladder will appear between the trochanters. We use a 10 per cent sodium bromide solution to produce contrast.

A study of the bladder with patient in the lateral position makes it possible to learn its relation to the conventional anatomical lines. It is found that the floor of the bladder is always above



Fig 6 Anterior view of same bladder as that shown in Figure 5 showing endovesical hypertrophy



Fig 7 Anteroposterior view of adenocarcinoma of the prostate. Bladder was filled with 180 cubic centimeters of opaque solution. This view shows loss of neatness of contour of bladder wall to the right also endovesical hypertrophy



Fig 8 Lateral view of *bas fond* of bladder shown in Figure 7. Infiltration of anterior wall and hypertrophy of the prostate. This diagnosis was confirmed first by means of MacCarty's cysto-urethroscope and afterward by operation.

a line drawn perpendicular to the superior surface of the symphysis pubis and not below such a line as is stated in some of the classical textbooks on



Fig 10 Case of vesico-intestinal fistula showing bladder, appendix, ileocecal valve, part of ascending colon and ileum filled with sodium bromide solution.



Fig 9 Fracture of pelvis. Bladder impacted between bony fragments. At the beginning there was only transient haematuria but pain after micturition continued. Surgical treatment was not attempted.

anatomy. This fact has often misled radiologists in the diagnosis of intraprostatic calculi.

① In the study of bladder diverticula cystography gives us an opportunity to inspect thoroughly the anterior and posterior walls. In the ordinary dorsal cystogram diverticula can not be seen as they are a part of the uniform opaque shadow of the bladder. Such diverticula can be located only by means of a lateral cystogram.



Fig 11 Bladder showing cells and diverticula.

(C) In prostatic adenomata the importance of the lateral cystogram is very relative still the lateral plate permits to a certain degree the estimation of the *bas fond*

(M) In bladder tumors the lateral view is of great advantage as it allows us to estimate the degree of infiltration of the bladder wall and this cannot be determined by cystoscopy

When neoplasms are associated with an intense degree of cystitis and when cystoscopy is impossible combined dorsal and lateral cystograms serve to determine the chances of success in surgical treatment. We consider the combined form of inestimable value also in revealing many clinical facts which otherwise would remain obscure

In support of our theories we include a report of some clinical observations

CASE 1 Into a normal bladder 80 cubic centimeter of a 10 per cent sodium bromide solution was injected. The bladder is not completely filled as is shown by the flattening of the dome (Fig 1). Figure 2 a lateral view shows characteristic shadows in incomplete filling

CASE 2 A normal bladder was distended with over 200 cubic centimeters (up to 400 cubic centimeters) of the bromide solution. The anteroposterior view (Fig 3) shows the spherical shape and the very well outlined circumference. The lateral view (Fig 4) made under identical conditions shows clearly the symphyseal rectal and superior walls. When only 150 to 200 cubic centimeters are injected the shape of the shadow is oval in both positions, the apex corresponding to the neck of the bladder being directed toward the symphysis pubis (3)

CASE 3 This was a case of endovesical hypertrophy of the prostate. The bladder was filled with over 220 (up to 400) cubic centimeters of opaque solution. In the anteroposterior position we find an irregular contour due to bladder columns and a round shaped endovesical tumor

(Fig 5) The lateral view (Fig 6) shows the raising and flattening of rectal wall with formation of a *bas fond*

CASE 4 In this case an adenocarcinoma of the prostate extended into the bladder. The anteroposterior cystogram obtained with over 150 cubic centimeters of opaque solution shows infiltration of the anterior wall (Fig 7). In the lateral view we see an extension of the malignant process into the rectal and superior walls (Fig 8)

CASE 5 This patient sustained a fracture of the horizontal branch of the pubis and other fractures of the pelvic bones. The result was transient hematuria at the beginning but pain after micturition persisted. Through clinical examination rupture of the bladder was absolutely excluded. The anteroposterior cystogram taken 4 days after the accident shows the nipping of the bladder between the osseous fragments. A cystogram taken 42 days after the accident (Fig 9) shows incarceration of a portion of the bladder in the osseous repair. Cystoscopy gave no light on this fact

CASE 6 Patient entered the D. Department complaining of the passage of gas and feces with the urine. Cystoscopy was impracticable because of the intense degree of cystitis. Anteroposterior cystogram with bromide solution made possible a diagnosis of vesico-intestinal fistula due to the rupture of an abscess of the distal portion of the vermiform appendix into the bladder (Fig 10). Surgical operation performed by Professor Sierra confirmed our diagnosis

The roentgenological work was performed in the Department of Radiology of the University directed by Prof. de Duca

LITERATURE

1. VESICER F. and LICHTENBERG A. Pyelographie Muenchen med. Wchnschr. 1926 liii No 3
2. FERRIS W. Surgical treatment of diverticula of the bladder. Ann. Surg. 1912 li 285
3. CHARRIN W. I. and VILLALBA H. Cistografia dorsal lateral. Rev. de Urol. Santiago de Chile 1923 September
4. COLTIER W. J. and DICEY J. Cistografia lateral. Rev. med. de Chile 1925 September

THE CLASP-RING A NEW INSTRUMENT FOR INTESTINAL ANASTOMOSIS¹

A PRELIMINARY REPORT ON A NEW MECHANICAL DEVICE AND A NEW METHOD FOR INTESTINAL ANASTOMOSIS

By JOSEPH B. BACON, M.D., I.A.C.S., MACOMB, ILLINOIS
B. A. C. I.

THE intestinal clasp ring is a mechanical device for safe and rapid end to end anastomosis. By means of this instrument the ends of intestine are held in secure approximation which prevents leakage and insures a complete union before the instrument becomes detached and is passed down the bowel.

The apparatus consists of a light metal tubular clasp, an inner cylinder and two thumb-like rings of the same material, and a rubber ring

The procedure is as follows. A pure string suture is placed in each end of the intestine to be approximated. The clasp part of the instrument is placed within one end and the ring part (previously tied with catgut to the rim of the cylinder) in the other end of intestine and both ends then tied firmly around the cylinder, which has been pushed part way into the tube of the clasp the whole being held firmly by special forceps grasping the cylinder just between the two ends of gut

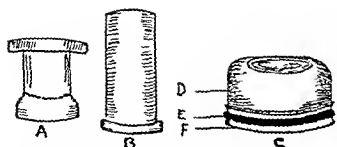


Fig. 1. Parts of clasp-ring actual size. A Clasp end B Cylinder C Ring end D Outer ring E Rubber ring F Inner ring

The drawings are by Maudred Van Cleave M.D.

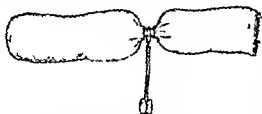


Fig. 2. Ends of intestine tied on cylinder with purse string suture; instrument grasped with forceps.



Fig. 3. Window cut through intestinal wall showing instrument at completion of operation.

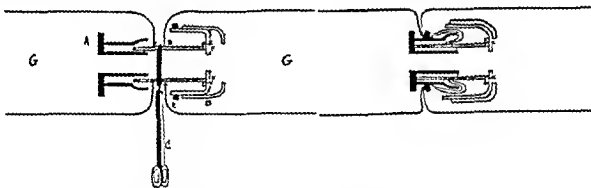


Fig. 4. Sagittal section through intestine showing clasp ring in position ready for removal of forceps. A Clasp end of instrument B Cylinder C Forceps D

Outer ring E Rubber ring F Inner ring G Intestine H Catgut tying ring to cylinder

Fig. 5. Sagittal section showing final stage of operation with rubber ring clamping both ends of intestine

Grasping the clasp through the intestinal wall with the thumb and finger of one hand and the rings with those of the other hand the two parts of the instrument are pushed together until they click into place. Then by pushing the outer metal ring forward the rubber ring slides off the inner metal ring on to the clasp where it anchors all the layers of both ends of the gut (serosa to serosa).

The catgut holding the two parts of the instrument together temporarily is soon digested permitting the two parts to pass along the intestine separately.

This instrument is an improvement upon, and the idea an outgrowth of my former instrument the intestinal dumb bell advocated for the same purpose and published in this Journal January 6, 1906 together with the end results of operations

performed upon animals up to that time. The dumb bell operation was justly criticized because an extra incision had to be made in the intestine so the operation was not performed upon the human subject. Yet all the animals recovered and post mortem inspections made after intervals of a few days to 8 months showed perfect results: no contraction and a minimum of scar tissue at the site of operation.

The same principle that governed the previous operation governs the new procedure, that is all the connective tissue of both ends of the gut is

taken in one ligature. Any possible leakage or infection at the line of the union is thus prevented and the connective tissue is held in place so that the serosa and muscularis both of which quickly atrophy under pressure can retract from the ring and unite end to end before the connective tissue is severed by tissue atrophy. This usually occurs in about 6 days.

The advantages of this method of intestinal anastomosis are (1) the simplicity of the operation (2) the absolute safeguard against leakage (3) the short time required for operation, (4) the dispensing with the necessity of reinforcing sutures (5) the short time which the instrument remains at the site of operation (due to the uniform necrosis of all connective tissue within 6 days) and (6) the minimum amount of scar tissue remaining

A METHOD FOR REPAIR OF POSTOPERATIVE VENTRAL HERNIA¹

By O. I. ILMSON, M.D. F.A.C.S. SEATTLE, WASHINGTON

THE repair of postoperative ventral hernia is often a trying problem especially when, through extensive and prolonged infection considerable fascia and muscle tissue have been lost and a large gap is left which cannot be closed by the usual method of herniotomy. In such cases the fascia and muscles cannot be drawn together and the surgeon is forced to use some kind of a graft to cover the opening. While we cannot hope to restore the abdominal wall to its former strength it is possible to repair it to the extent that it relieves the patient of the disagreeable symptoms that accompany hernia.

Transplantation operations for the repair of ventral hernia have been used since 1909 but there have been no definite reports regarding the ultimate and lasting results in a large series of cases. It is generally conceded that at least 2 years must elapse before the actual results in hernioplasty can be definitely determined. As long as such records are lacking one is justly re-

luctant to perform such a transplant operation, especially as there seems to be a definite factor against it a factor which has proved many a well performed repair ineffective i.e. because of the meager blood supply a transplant of fascia in the process of healing is likely to become too thin and weak to stand the strain of the abdominal wall. However the surgeon must face the situation when it presents itself and make some effort to give relief.

About a year ago I was confronted by a post operative large ventral hernia which seemed to indicate the use of a fascial transplant. I was operating for an infected gall bladder and post operative obstructive adhesions. The patient had been operated on twice some years before and had experienced prolonged convalescence as a result of an infection in the wound and the loss of considerable tissue.

When attempting to close the abdomen I saw that the right rectus muscle at a distance of 3 inches to the right of the midline near the umbilicus had been destroyed and left a large gap about 4 inches long and 3 inches wide. It was impossible to bring the tissues together to do a Mayo operation for repair of the abdominal wall.

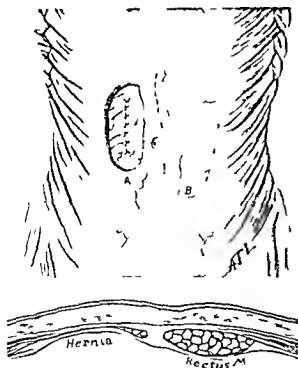


Fig. 1. Hernia. A. Peritoneum sutured. B. fascia to be used in transposition for repair of tissue. C. cross section of abdominal wall.

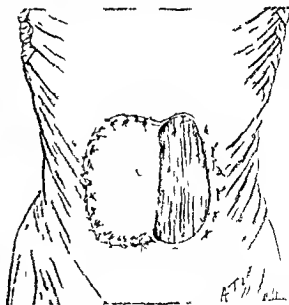


Fig. 2. Transposition of anterior fascia over hernia. The anterior fascia of the rectus from the opposite side was used to repair the gap.

¹Read before the meeting of the Association of the American Surgeons, St. Paul, Minn., October 19, 1915.

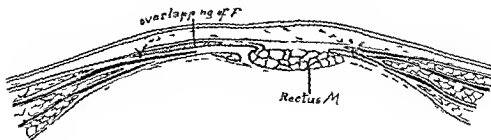


Fig 3 Cross section of transposed fascia

nor could the hernia be repaired by uniting the separate layers. Therefore, it was deemed wise to make use of the anterior fascia of the rectus from the opposite side to repair the gap. The patient's condition did not warrant a fascia transplant from the thigh even if I had so desired. So I made an effort to transpose rather than to transplant fascia.

The anterior fascia of the rectus muscle on the opposite side seemed sufficiently strong to use for repair, and so I dissected from it a flap 4 inches wide and 6 inches long. This was turned and lapped over the hernia and sutured with 40-day catgut. The location of the lesion in the rectus muscle in the region of the umbilicus was indeed a fortunate coincident, as the fascia at this region of the muscle is strong enough for use in such cases.

Since operation the patient has been relieved of the disagreeable symptoms incident to the hernia, and it looks as though she is permanently cured.

The argument that might be used against this method of repair of the abdominal wall is that the strong side is weakened when it is denuded of its anterior sheath. However, this is not as serious a matter as it seems, because the muscle bands are well linked by the linea transversa. Also, the fibrous tissues which form assist in holding the muscle fibres together.

This type of hernia in which there is so much loss of tissue is comparatively rare, and any one surgeon cannot expect to have a large enough series of cases to prove the merits or demerits of this type of repair. One case, of course, is not sufficient from which to draw conclusions. I can only say that there are circumstances in which a transposition of fascia for the repair of large post-operative ventral hernia may give better results than the transplantation of fascia.

The apparent satisfactory results in our case indicate that transposition of fascia merits a trial in certain cases.

THE USE OF ETHYLENE IN OBSTETRICS

A REPORT OF EIGHTY FIVE CASES¹

By JOSEPH KREISELMAN, M.D. AND HOWARD F. KANE, M.D. F.A.C.S. WASHINGTON

ANÆSTHESIA is as justifiable in all obstetrical cases as it is in surgical operations. Simpson's use of chloroform in obstetrics was denounced from the pulpit as impious and contrary to Holy Writ. The general declaration being that to use chloroform was "to avoid one part of the primeval curse on women." So strong was the power of the Church, so universal the belief in the guilt of all women, that, notwithstanding the fact that Simpson wrote many pamphlets to defend the blessing he had introduced, he seemed about to be overcome, when he seized upon a new weapon, which was probably the most

absurd by which a great cause was ever won. 'My opponents forget,' he said, 'the twenty-first verse of the second chapter of *Genesis* it is the record of the first surgical operation ever performed, and that text proves that the Maker of the Universe, before He took the rib from Adam's side for the creation of Eve, caused a deep sleep to fall on Adam.' It was a stunning blow. This with a few other remarks, dispersed the enemy forever and the greatest victory of science against suffering was gained. We still find some physicians who believe that pain during childbirth is desirable and its prevention hazardous.

¹ Presented at a meeting of the Medical Society of the District of Columbia, March 17, 1926.

Since the time of the introduction of an esthesia in obstetrics great advances have been made in the development of anesthetics and in their administration. It was soon discovered that chloroform was not without great dangers and this was replaced by ether although there are still physicians who believe as did Simpson that chloroform is indicated in obstetrics.

Recently nitrous oxide has taken its place and this gas used in sequence or in combination with ether has enjoyed much popularity in the past few years. Still more recently ethylene has been introduced and this anæsthetic we believe to be the one of choice in all obstetrical procedures.

In this paper we shall endeavor to outline briefly a method of obtaining obstetrical anæsthesia which we have found to be satisfactory in all types of cases. In the small series to be reported this procedure has given almost complete satisfaction and an entire absence of accidents and clinical complications.

There are two general conditions to be considered in the administration of an anæsthetic in an obstetrical case. The first is the general condition of the mother, the second the condition of the fetus. Among the general conditions we must bear in mind the possible influence of the anæsthetic on pulmonary, cardiac and renal lesions as well as the toxæmias of pregnancy. We must also consider the influence on the progress of labor.

Experience in general surgery has shown that ethylene has no ill effect on the heart, lungs, or kidneys. In several cases of toxæmia early in pregnancy and in one case of eclampsia we have used ethylene with excellent results. Its effect on the progress of labor will be described later in this paper.

A general anæsthetic is rarely necessary before the second stage. It has been the custom to delay anæsthesia as long as possible however we attempt to begin just as the head is passing through the cervix or a little before. The demand increases as labor progresses and we must be able to supply this demand rapidly and safely without impeding progress. The administration must vary in order to meet the special requirements of each individual case, and for this reason it would be impossible to lay down definite rules.

It is essential to have the proper anæsthetic machine for obstetrical administration. One which is of the intermittent flow principle should be used in order to deliver the agent to the patient the instant that it is demanded. This should be when the patient subjectively experiences uterine contraction. It should also be of a type that de-

livers gases in mixture of a definite percentage. This is necessary because when the proper mixture for the patient is determined this can usually be continued without change until near the end.

Anæsthesia is begun with 100 per cent ethylene and the patient is allowed to breathe without instruction. As soon as the induction is complete (the number of breaths varies) the anæsthetic is stopped and the patient is allowed to recover. This recovery takes place after the painful contraction has ceased. The patient is then asked to tell immediately when the next pain comes. The same mixture is used if the pains are long and severe or a more diluted mixture if they are short. Upon recovery from this pain, the patient usually has confidence in the ability of the anæsthetist to relieve her suffering.

At this time one's judgment of the number of breaths and proper mixture to be used has been formed and the patient is accordingly instructed. She is now ready to obey.

Ordinarily analgesia is obtained by asking the patient to take three inhalations. She is instructed to hold the first inhalation and bear down.

A mirror is now placed at the foot of the table, as suggested by Doctor Kane. This enables the anæsthetist to observe the progress and govern the mixture of the anæsthetic.

As the head approaches the vulva the anæsthetic is deepened. The most extreme anguish is experienced when the head passes through the vulva and so at this time surgical anæsthesia is induced and the fetus delivered. This degree of anæsthesia is continued until necessary repairs have been completed.

Anæsthesia or analgesia is obtained very quickly usually in two respirations. Annoyance between pains is almost always abolished. There is rarely any full pain appreciation and very often there is a complete amnesia between pains but without the confusion so common with other anæsthetics. Confusion may occur we have had it in one case. Complete relaxation for the final pains is quickly produced and recovery is very prompt. This relaxation is peripheral only and there is not the danger of postpartum hæmorrhage from atonia which may be produced with ether.

Ether is an irritant to lungs, kidneys, and liver. In cesarean section there is less shock, decreased vomiting, less distention and pain from this cause when ethylene is used and dilated stomach which so often follows cesarean section has not been noted in any case in this series. The only difficulty is to be encountered when the parietal peritoneum of the upper abdomen is stimulated by packing off the intestines.

The heart of the fetus is not influenced and breathing begins apparently sooner than with other anesthetics or no anesthetic. This is also very striking in cesarean section.

REVIEW OF CASES

In reviewing the 85 cases in which we have employed ethylene as an anesthetic, we find that 33 were delivered spontaneously, 23 by low forceps, 9 by mid forceps, 6 by podalic version, and 14 by cesarean section. One of the cesarean sections was of the low, or cervical type, and one of the versions was in a case of twins—a double version. There were 53 1 para, 25 2 para, and 7 3 para.

Practically all of the primiparae and many of the multiparae had received during the first stage from one to three hypodermic injections of morphine sulphate grains $\frac{1}{4}$ in 2 cubic centimeters of a 50 per cent solution of magnesium sulphate. In several cases the hypodermic seemed to have little or no effect, so the rectal injection of quinine, ether, alcohol, and olive oil, as suggested by Gwathmey, was employed. This preliminary narcotization seemed to increase the efficacy of the ethylene.

In the first half dozen cases administration of the gas was not started until the second stage of labor had been definitely reached. Subsequently, it was begun if possible just before the cervix became completely dilated. It was found that the full analgesic effect of the gas was not obtained during the first few pains. By beginning to give the anesthetic earlier, the contractions could be rendered painless by the time the patient was in the second stage.

The duration of the second stage seemed to be lessened. With the abolition of pain, the patient would use her voluntary expulsive powers throughout the entire period of uterine contraction, none of her strength would be wasted in screaming and tossing about on the table. The patients were conscious, and would carry out instructions. In many cases drowsiness persisted between pains. Unless the progress of the head was continuous, the perineal portion of the second stage was frequently shortened by delivery with low forceps after perineotomy.

No harmful effects on the child were noted. On the contrary, the promptness with which these babies breathed and cried was noticeable. The statements of the patients after delivery seemed to show that during the administration of ethylene the sensation was of well being and comfort, followed by a "fading away." This was not accompanied by the feeling of suffocation, whir-

ling, pounding, etc. which is so often complained of with other anesthetics.

As to results, the patients have been divided into four groups. Class 1 consists of the cases in which the effect of ethylene was considered to be entirely satisfactory. No patient was included in Class 1 who did not say that she felt no pain after the beginning of ethylene administration. Many reported, in addition to analgesia and anaesthesia, amnesia covering the entire period. The most striking results were usually in multiparae. Frequently by the use of morphine and magnesium sulphate in the first stage and ethylene in the second, the patients reported that the entire labor was practically painless. Many of the primiparae retained vivid recollection of first stage pains in spite of narcotic medication. Sixty were considered to be in Class 1.

In Class 2 were placed those patients who admitted marked relief from pain, but not complete analgesia. In every case, faulty co-operation on the part of the patient could account for the partial lack of success. Failure to carry out instructions regarding inhalation of the gas deprived these women of the full benefit of the anesthetic. Relief from pain could be proved in these cases by withholding the gas for several contractions. In Class 2 are 9 cases.

Class 3 consists of cases in which the use of ethylene proved to be absolutely unsatisfactory. Only two patients fell into this group. One woman was a foreigner of rather low mentality. She preferred pain to the helpless sensation of partially losing consciousness. The other failure was in the case of a highly neurotic woman. She became unconscious after three or four inhalations, awoke with a scream of terror, and begged that no more anesthetic be given as she had had a most horrible dream.

Class 4 consists of the 14 cesarean sections. In these cases relief of pain was not the object sought. Ethylene seems to be almost an ideal anesthetic for abdominal deliveries. The rapidity with which anaesthesia is induced, the satisfactory muscular relaxation, the absence of ill effects on the fetus, the promptness with which the patients regain consciousness, and the freedom from lingering after effects form a combination of qualities which can be equaled by no other anesthetic.

In performing the 6 versions, uterine relaxation was as complete as could be wished. In one case the child weighed 10 pounds, 8 ounces and was turned without difficulty. The delivery of twins was in no way hampered by lack of relaxation.

Ethylene owes much of its value in labor to the flexibility with which it may be administered.

Two or three inhalations permit a perineotomy to be done if it is desired, two or three more allow absolutely painless delivery of the head, a few breaths of air, and the patient is awake with no knowledge of what has happened

SUMMARY

1 Complete analgesia was obtained in 84 per cent of our cases, appreciable relief from pain in 13 per cent and failure in 3 per cent

2 Progress during the second stage of labor seemed to be more rapid

3 No harmful effects on the child were noted

4 Podalic version was easily performed under ethylene anesthesia

5 Ethylene seemed to be the ideal anesthetic for cesarean section

6 The efficacy of ethylene seemed to be increased by the use of morphine in the first stage

7 Ethylene is valuable in the second stage of labor because with it analgesia and anesthesia are rapidly induced its action is fleeting there are apparently no latent ill effects on the mother or child

REFERENCES

- GWATHMEY et al. Painless childbirth by synergistic methods. *Am J Obst & Gynec* 1923 VI 436
 FANE H F. A delivery room mirror. *Am J Obst & Gynec* 1926 XI 533

CORRESPONDENCE

RADIATION OF BLADDER TUMORS

To the Editor When radium is applied to neoplasms of the urinary bladder it is difficult to maintain the necessary approximation. There is usually a period of many hours during which the radium must be in contact with the base of the neoplasm if any therapeutic result is to be expected. In our experience it has been almost impossible to keep the radium in the exact position and contact desired.

We find the following technique satisfactory. After the bladder has been opened and the neoplasm cauterized the radium is placed in the desired position. The wall of the bladder is then drawn over the radium and held in place by a couple of sutures. After the desired number of hours of radiation the bladder is reopened under gas anesthesia the sutures removed and the radium taken out. In this way it is possible to be sure that the radiation has

been given to exactly the site desired. We have not seen this method described.

W J JENNOCK and W J SPARK
 Spokane Washington

THE TECHNIQUE OF ABDOMINAL HYSTERECTOMY FOR CARCINOMA OF THE UTERUS

A Correction

In editing Professor Franz's article describing his technique of the abdominal hysterectomy for carcinoma of the uterus page 185 in the August 1926 issue of *SURGERY GYNECOLOGY AND OBSTETRICS* an error was made in the interpretation of the word *Collumkarzinome*. The first sentence in the article should read: For twenty one years I have used the abdominal route as proposed by Wertheim in operating upon carcinoma of the cervix uteri.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D.
ALLEN B. KANAVEL, M.D.

Managing Editor
Associate Editor

WILLIAM J. MAYO, M.D.

Chief of Editorial Staff

SEPTEMBER, 1926

EXTRA-ARTICULAR ARTHRODE- SIS WITH AUTOGENOUS BONE GRAFT

IN tuberculosis of the spine, hip, and sacroiliac joints, intra articular arthrodesis, either spontaneous or operative, is most unfavorable, and at best requires a very long period of time, because of (1) the destruction of bone, (2) the inhibition of osteogenesis by the tubercle bacillus, (3) the peculiar anatomy, and (4) the relative inaccessibility of the joint to surgical procedure. Broad surfaces of bone cannot be brought together, and too much dead space intervenes. To meet this exigency, the author introduced eighteen years ago, the autogenous bone graft as a means of producing extra articular arthrodesis of the spine in cases of tuberculosis of the vertebral bodies. Since then the same principle has been applied with equal success to tuberculous hips and sacroiliac joints and to any condition of the spine—static, paralytic, infectious, traumatic, or congenital (spina bifida)—which demands operative interference to effect support, correction of deformity and immobilization.

Because of the anatomy and mechanical relationship of these joints (for convenience,

the spine will be regarded as a joint), the parts do not tend to approximate as extensive destruction of bone progresses, and since tubercle bacilli inhibit the active osteogenesis which would normally take place, dead spaces between bony elements intervene and spontaneous ankylosis and cure become impossible. Even if intra articular arthrodesis is attempted in the hip or sacroiliac joint, which are relatively more accessible than the spine, the impossibility of removing all tuberculous material, and the probability of causing metastatic infection, or sinuses with secondary infection, and failure to secure fusion, render the operation untrustworthy.

In tuberculous destruction of all of these joints, the approximation of receding necrosing bone surfaces is delayed or prevented, as portions of extra articular involved bone impinge upon each other, or as soft tissue becomes interposed between these bone prominences. Tuberculosis of the spine is almost always restricted to the vertebral bodies, the spinous and lateral processes and facets remaining intact. Consequently the dense lateral processes with their facets sustain the superincumbent weight as a fulcrum in a lever, and the strong muscles and ligaments resist the separation of the posterior ends of the spinous processes, thus preventing the collapse together of the necrotic bone surfaces of the partially destroyed vertebral bodies and defeating spontaneous ankylosis, which might otherwise occur. X-rays repeatedly illustrate this point.

In the hip, the X ray shows that most of the femoral head and acetabulum are many times destroyed and that their necrotic surfaces are

prevented from coming in contact by the impingement of the trochanter with the soft parts between it and the rim of the acetabulum and the side of the pelvis. Moreover, we have a spherical surface within a concave surface, which as they become necrosed, tend to recede farther and farther from each other, and become more and more unfavorable to intra articular arthrodesis. In the sacro iliac joint, soft parts impinge between the posterior wing of the ilium and the lateral and posterior surfaces of the sacrum preventing in a similar way the approximation of the necrotic bone surfaces.

Braceage and other mechanical means of obtaining immobilization in extensive involvement of these joints have proved notably unsuccessful, because of the unfavorable local intra articular and extra articular anatomical condition as enumerated but also because of the impossibility of satisfactorily immobilizing and supporting these joints in an ambulatory way by any external means such as braces plaster of Paris splints etc. Since in the case of the spine we have a series of bones with their outside dimensions practically that of cubes embedded completely in strong muscles both of the voluntary and involuntary type, these muscles have their insertion upon these bones through the medium of projecting processes such as the spinous and lateral processes and therefore diseased vertebrae are constantly subjected to motion one upon the other both by voluntary muscles and those of respiration. Further the progress of bone destruction is a vicious circle, especially in the dorsal region in children, in that the greater the vertebral body destruction the less the resistance thus furnished to abnormal motion between the diseased vertebrae. While on the contrary the greater the intervertebral motion the greater the vertebral body destruction and further progress of

the disease. Suffice it to state in relation to the unfavorable conditions for braceage at the hip and sacro iliac joints that they are situated at the cross roads of the trunk and thighs, beneath the thickest and most powerful muscles of the body, which not only prevent immobilization by coaptation splintage but serve to irritate the joint beneath by producing motion therein, in spite of external braceage. This difficulty is again further accentuated because of the unfavorable anatomical contour of the bony elements which make up all these joints to coaption splintage.

Further the danger of causing metastatic infection or sinuses, immediate or remote, by traumatizing an acute tuberculous area, without being able to remove all involved tissue renders entrance into tuberculous joints which are difficult of approach undesirable. In the case of the spine, of course, it is realized that the infected area is so situated as to be inoperable.

Since it is evidently impossible to meet the fundamental requirements of intra articular arthrodesis, namely thorough removal of all tuberculous tissue close contact of large surfaces of bone and elimination of dead spaces extra articular arthrodesis has its advantages. The autogenous bone graft already referred to, produces this effectively and satisfactorily.

In the spine the graft by forming a bony bridge from vertebra to vertebra prevents all motion from whatever cause. Since the vertebral bodies are, practically speaking, inaccessible to the surgeon the arthrodesis must be extra articular the graft is inserted into the spinous processes, thus fortifying nature's efforts and producing the absolute ankylosis which nature, because of the anatomical structure, has been unable to effect.

The same can be said of the application of this method to the hip and sacro iliac joints. In both of these, the mechanical difficulties to

complete immobilization are great, but with strong bridging, a tibial graft or grafts being mortised in each instance well into the bony elements of the joint, complete fixation is secured. The immobilizing influence of union of the femur to the pelvis makes it unnecessary to enter the infected area.

In advanced cases, the response to this procedure, both in respect to control of symptoms and of the pathological lesion, after braceage and apparatus have failed, has been most striking.

FRED H. ALBEE

IMPORTANCE OF ABDOMINAL RIGIDITY

ABDOMINAL rigidity which develops rapidly in association with or without pain usually indicates a more or less serious local intraperitoneal lesion. In this early stage the importance of such localization is not always so promptly and fully appreciated as to give the urge for immediate action. There cannot be much time for observation for often a delay of a few hours may decide for or against recovery.

As is well known, the muscular rigidity is the result of a severe localized infection or a perforation of a viscus, more often to a duodenal or gastric perforation. The escaping visceral contents excite through the sympathetic, an afferent sensory impulse which is reflected through the spinal neurones, and the efferent nerves of motor tracts bring about muscular contraction over that part of the abdomen where the lesions exist. Experience has shown that the severity of the lesion is in direct proportion to the rigidity. We have also learned that rigidity often exists without a pulse increase or an elevation of temperature.

The leucocyte count may be normal or nearly so. The pain may be severe or moder-

ate. The predominant feature is the muscular rigidity. Surgical intervention is urgent; a clinical diagnosis must be made, too much time must not be consumed with laboratory refinements.

It not infrequently happens that a case is studied too long, awaiting the development of other symptoms. A symptom complex consisting of accelerated pulse and temperature, an increased leucocyte count and pain, may make the diagnosis more certain, but the invasion of infection may have become so extensive as to preclude a recovery. Cases have come to every surgeon whose fate has already been sealed on account of a lack of appreciation of the warning indicated by a hard abdomen. It may be that in patients with a large amount of adipose covering the abdominal parietes it is difficult to realize its existence fully. The drawn up knees, when extended, will increase the pain and distress, and in most cases will reveal the rigidity. The appearance of sudden muscular rigidity may or may not have been preceded by gastric disturbance, biliary distress, or pain or discomfort referred to the iliac fossa.

We have become so accustomed to associating a definite syndrome with well known and definite pathological entities, that unless the syndrome is complete, we hesitate. We should always first consider the primary symptom, objective or subjective, in the complex or syndrome and not be lead astray because the syndrome group is not always complete. It is well known that muscular rigidity in acute abdominal lesions may disappear in 12 or 24 hours, followed by a generalized abdominal pain and distention with uncertain local tenderness over the initial lesion materially lessening the chances for recovery. A general peritonitis has developed.

A. F. JONES

MASTER SURGEONS OF AMERICA

JAMIS HENRY DUNN

DR JAMIS HENRY DUNN was born in Fort Wayne Indiana, on May 29 1853 and died on June 18, 1904. When he was 3 years old his father removed from Indiana to Winona County, Minnesota, and engaged in farming. Dr. Dunn received his early education in the public schools, entering Winona Normal School in 1869 at the age of 16 and graduating with honors 3 years later. He then became principal of the public schools at Alexandria and at Sauk Center Minnesota respectively. While working in this field, he became interested in school hygiene and decided to study medicine in order to make himself a better teacher. He graduated from the University of New York in 1882 and at once began general practice at Shakopee Minnesota, a small town located about 20 miles from Minneapolis. Five years later, in 1887, Dr. Dunn went abroad to do postgraduate work spending most of his time in the teaching universities of Vienna and Berlin. After 4 years he returned home and located in Minneapolis where he began the practice of medicine and surgery. In 1895 he married Miss Agnes MacDonald of Kansas City. They had one son.

A firm grasp of the subject of medicine combined with the background obtained by a period of teaching and an experience in general practice laid the foundation for the duties which were to fall to his lot in later years. Dr. Dunn was professor of genito urinary diseases at the University of Minnesota from 1889 to 1894 when he became professor of clinical surgery. In 1899 he succeeded Dr. Charles A. Wharton as head of the department of surgery and occupied that position until his death 5 years later. It is the opinion of those who were best acquainted with the accomplishments of Dr. Dunn after he had reached complete development as a surgeon and a teacher that two factors only interfered with an international appreciation of his exceptional ability. The first of these was the inborn diffidence and modesty of the man, the second his untimely death at the age of 51. As a teacher he was to the Northwest what Doctors Senn and Murphy were to Chicago. His clinics were attended with enthusiasm by graduates in medicine, well known surgeons and students alike.

If Dr. Dunn's teaching contained any one outstanding characteristic more than another, it was that it embodied the plain statement of the truth as he saw it without regard to any untoward effect it might produce upon himself. What



JAMES HENRY DUNN
1833-1904

he considered his own mistakes were most frequently presented in order to bring home the point he wished to make. Honesty in a superlative degree was his beacon light, and this attribute stood out with especial distinctness in relation to his method of teaching.

From a scientific standpoint, Dr. Dunn's abilities were most extensively developed along lines of clinical diagnosis and treatment, combined with clinical and didactic teaching. His personal interest in his clientele placed him at the beck and call of any who desired his services at any time of day or night. Notwithstanding the fact that he was a chronic invalid during his entire adult life, his working capacity was prodigious. His only relaxation was obtained in his attendance at high class musical entertainments of which he was exceptionally fond. The unremitting fervor with which he threw himself into his work undoubtedly shortened his life.

Looking back over the aids to diagnosis which have been introduced during the last 25 years, his diagnostic ability without such aids stands out in bold relief. As a technician he lacked in some degree the finesse which some other surgeons of his period possessed. This was due perhaps to his anxiety, first, to certify his diagnosis and, second, to institute the proper method of treatment, thus relegating a refined technique to a secondary position.

His knowledge of French and German added greatly to his capacity for familiarizing himself with the literature of his time. His memory in relation to things medical was phenomenal and yet in other matters he was absent minded to a degree. For instance, it is authoritatively related that 3 months after his marriage, he returned one day to his pre-nuptial residence, entered, and sat down at the dinner table. When some one of his acquaintances asked if Mrs. Dunn were out of the city, he said "Oh—I," jumped up, found his hat, and went on home.

As an example of his intense desire to offer his students the most recent developments in surgery, one might relate that at the time Dr. Bigelow developed a method of producing and reducing dislocations upon the cadaver, Dr. Dunn at once traveled to Boston and familiarized himself with Bigelow's work. Upon his return he had constructed a table similar to that which Bigelow had devised, and dislocations were produced and reduced in the presence of and often by the students. Not infrequently he insisted upon an open dissection being made to show the exact anatomical and pathological conditions which obtained following the dislocation of the various joints. This is only one of many examples of the thoroughness which characterized the work of Dr. Dunn.

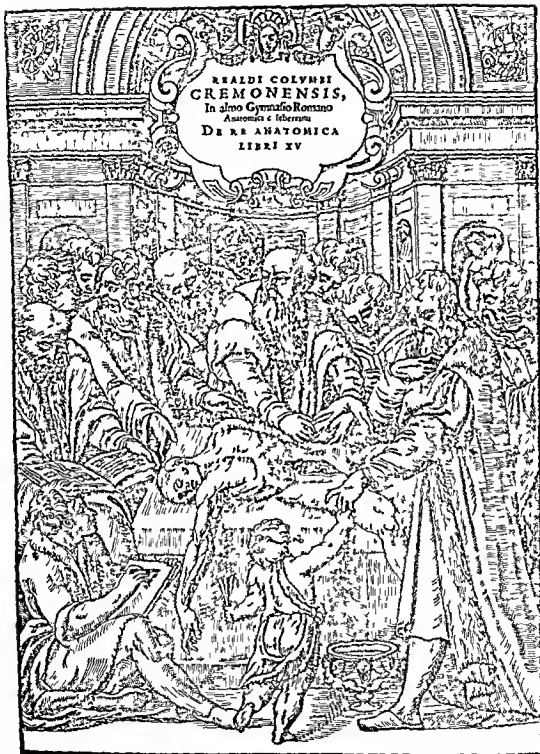
After years of overwork and ill-health, Dr. Dunn had the misfortune to develop a lung complication followed by empyema during which he not only nearly lost his life but was incapacitated for about a year. This left him with a severe myocarditis. Upon his return to active practice, he showed renewed vigor, and the esteem in which he was held by doctors and patients alike was demonstrated

by the overwhelming amount of surgery which presented itself almost immediately. It was during these years that his strenuous efforts to meet the demands of his practice aggravated the condition which brought about his untimely death. He worked at high speed many hours of each day without recreation, and being unable to sleep well lying down because of the condition of his heart, he formed the habit of reading far into the night. He finally succumbed to myocarditis while attending a meeting of the American Surgical Association in St. Louis. He was found dead in his hotel room a short time after presenting a paper on the "Treatment of Benign Oesophageal Stricture."

Throughout Dr. Dunn's professional life he was honored by election to many important offices. He was an ex-president of the Hennepin County Medical Society, the Minnesota State Medical Association, and numerous other societies to which he belonged. At the time of his death he was vice-president of the American Medical Association.

Dr. Dunn died as he lived "in the harness," and from his life two great lessons may be drawn: first, that the love, honor, and respect of our fellows can be gained only by emulating such a life as Dr. Dunn lived, and second, that a more frequent resort to some sort of relaxation might have given the Northwest one of its leading surgeons and the good that he could accomplish for a much longer period had he not devoted his energies quite so strenuously and wholeheartedly to what he considered his duties. ROBERT FINEST FARR, M.D.

REALDI COLVNSII
CREMONENSIS,
In almo Gymnasio Romano
Anatomica e leberum
DE RE ANATOMICA
LIBRI XV



VENEZIIS, Ex Typographia Nicolai Bevilacqua, M D LIX
CVM PRIVILEGIIS

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED J. BROWN M.D. F.A.C.S., OMAHA

THE ANATOMY OF REALDOS COLUMBUS

THE early sixteenth century marked a period of upheaval of old ideas in many fields. That one of the fields thus plowed and harrowed was surgery is easily seen by reference to the works of many of the surgeons of that period in different lands, with possibly Paracelsus as the most outspoken leader. Closely following surgery in this revolt against the old order of things came anatomy its closest ally, and the van was led by Vesalius who published his six large plates in 1538 which were followed by 'De corporis humani fabrica' in 1543 and the 'Epitome' published in the same month of the same year. Vesalius' works raised a veritable storm. On the one hand were the "stand patters" represented by the so-called highly educated class who believed nothing could or should supersede or question Galen and the Arabians and on the other the more progressive type of surgeons who believed in advance. By the latter Vesalius was recognized as the proper successor to Galen. But Vesalius was in turn to be outdistanced and by one of his own pupils Columbus.

Matteo Realdo Columbus to give him his full name was born in Cremona. His father was a pharmacist and at first he followed in his footsteps. He then studied surgery with Giovanni Antonio Piazzi and anatomy under Vesalius.

In 1540 he was appointed professor in Padua and in 1542 filled Vesalius' chair during the latter's absence until 1544 when he was made his successor as professor of anatomy. Later he became unfriendly to his preceptor but this could not be gathered from his book for in the introduction he writes of Vesalius in terms of high praise. In the same year (1544) he left Padua for Pisa and 4 years later was called to Rome by Pope Paul IV. He died in 1559, the year his anatomy appeared. The book was given out by his two sons and published at Venice by Nicolas Bevilacqua. The book bears the title 'The Fifteen Books of Realdo Columbus of Cremona. Illustrious Anatomist in the Sacred College of Rome concerning anatomical things'.¹ It is a well printed folio volume but without illustrations save for the beautiful title page.

That Columbus was well aware of the trend of the medical mind at this time and was likewise thorough at variance with it is shown by his preface to the reader. Here he writes first of his long labor

at dissection and then goes on to say 'I thought there would not be lacking those who would reject these attempts of mine as useless and superfluous who would set forth with great pride in the light of teaching new things about anatomy, their own Avicenna the chief as they say, of students Mundinus and Carpus, as the outstanding men in Anatomy concerning whose writings nothing at all seems to be able to be said in this theme.' He then speaks a little more kindly of Galen and Vesalius and ends his first paragraph 'However no one could hinder me from writing since it can be replied easily and truthfully to their frivolous objections, for to those three authors whom they first mentioned, I think this trite verse applies. There are good ones there are certain mediocre ones there are more bad ones.'

As the title shows, the work is divided into fifteen books beginning with the bones and ending with a chapter on anomalies which is the most interesting portion from a surgical standpoint. In this he describes both deficiency in and supernumerary ribs and vertebræ ankylosis of the vertebræ and spine, supernumerary fingers and bifid thumbs. Anomalies of the muscular system. Double ureter and single kidney. Adhesions between liver and abdominal wall. Adhesions between lung and chest. Fluid in the thorax. When it comes to calculi he mentions nearly all the calculi which are found renal, pulmonary, hepatic both in the liver substance and in the gall bladder, ureteral-vesical and even those found in the colon and hæmorrhoidal veins. He also mentions various types of abscesses and tumors. The chapter gives one the idea that he had performed many postmortem examinations and in some cases he mentions the name of the person in whose body he found the condition. In several instances it was the body of a Cardinal.

It is, however, the description of the pathway of the lesser circulation that was Columbus' greatest contribution. It is clearly stated in his own words "The septum is between these ventricles through which almost all think that an opening for the blood is made from the right to the left ventricles, and this in order that because of the vital spirit the new blood may be returned thinner in the transit. But these err greatly for the blood is carried through the arterial vein to the lung, and here is thinned out then it is carried down with air through one venal artery to the left ventricle of the heart. This no one has so far noticed or left writing about, how ever much it ought to have been noticed by all."

¹Courtesy of Dr Leroy Crummer Omaha Nebraska

REVIEWS OF NEW BOOKS IN SURGERY

YOUNG'S Practice of Urology¹ consisting of two volumes with a total of 1 460 pages has had on a study of 12 500 cases is unique. In this work we find a style of writing and organization different from that usually found in the medical textbook. The authors presume that readers of this work have a working knowledge of fundamentals of urology and write essentially from the clinical point of view. The style is fascinating the print type and size of page are not tiring. The illustrations as well as explanatory tables of facts are ample. The organization is logical and not pedantic.

We first have a discussion of physiology of micturition based on the personal work of the author and then a chapter dealing with obstruction to the passage of urine. The chapters written on urogenital infections are especially interesting and valuable because of the original work of the authors with dyes especially mercurochrome.

The important subject of urolithiasis is conservatively discussed with an especially good section on the principles of treatment. As expected the authors have covered the subject of prostatitis very thoroughly. Through all the prostatic work they have emphasized the perineal operation. One wonders whether they have sufficiently dwelt upon the difficulties of this operation when performed by less experienced operators.

Neoplasms of the entire urogenital tract are included in one section. The interesting radical perineal operation for cancer of the prostate and tuberculosis of the same region is discussed in detail. Malformations and abnormalities of the urogenital tract include a lucid embryological discussion.

A chapter is inserted on the diagnostic significance of special urological symptoms and also one on examination of the urological patient. These are excellent because of their practicalness.

The operative work discussed in connection with the various maladies of each urogenital organ comprises a distinct chapter thus obviating the necessity of much repetition. The original work on bypospadias and epispadias is especially attractive.

To indicate a closer relation between the pediatrician and urologist there is a discussion of urology in infancy and childhood. From the standpoint of organizing genito-urinary work the pages on urology in war and the study and teaching of urology in Johns Hopkins Medical School are important and interesting subjects.

HARRY CULVER

IN the past twenty years the neurologist and his progress in matters diagnostic have enormously challenged the neurological surgeon in the treatment of intracranial new growths. It would seem that now the neurological surgeon might throw

down the gauntlet to the neurologist. A monograph² has appeared on the intracranial gliomata which is a striking example of the progress made in the surgical treatment of intracranial new growths. The gliomata represent about 4 per cent of all intracranial neoplasms in a series of more than 1 000 cases and in the past have been generally looked upon as hopelessly malignant tumors.

Many patients in this series of gliomata have survived for surprisingly long periods even after an incomplete removal of the growth. This fact coupled with the advances in cytological methods made by Cajal his pupils and others called for a careful study and reclassification of the gliomata. The importance of such a work correlated with the clinical histories of the patient cannot be overemphasized in the prognosis and progress of surgical treatment of intracranial tumors.

The classification and terminology made by the authors is soundly and fundamentally based upon the histogenesis and normal structure of the brain. In a general way it was found that those gliomata whose structure was that of the less differentiated cells of the central nervous system are more rapidly growing than are the tumors composed of more highly differentiated cells. Fortunately about one half of the gliomata in this series belong to the latter group. In themselves they may be looked upon as relatively benign growths. An inaccessible location or the complications of interference of the cerebrospinal fluid pathways of course greatly affect their prognosis.

As I said before the subject matter in this monograph challenges all neurologists and neurological surgeons to have a thorough understanding of the clinical course of the lesions they diagnose and treat. Certainly the nature of the surgical procedure adopted goes hand in hand with the type of tumor disclosed. It is not a thing too much from the applications of such knowledge to be able actually to diagnose the nature of the tumor to be encountered.

There can be no question in my mind that the future progress in the surgical treatment of intracranial tumors lies in the direction pointed in this book. Moreover the gliomata constitute the domain of the neurological surgeon and his brother neurologist. There is no other clinic from which such a series of intracranial tumors may be collected. It is to the everlasting credit of its director that the clinical operative and pathological records are so thorough and complete as to make such a study possible. It is a score at which the younger group of neurological surgeons may aim. I know that the authors personally will share in the happiness and success of those who will follow it in the coming years.

LOYAL DAVIS

¹Young's Practice of Urology based on a Study of 12 500 cases. By Hugh H. Young and David M. Davis with the collaboration of F. H. Johnson. 12 vols. 1280 pp. Philadelphia and London: W. B. Saunders Company, 1919.

²A Classification of the Tumors of the Glia Group on a Histogenetic Basis with a Correlative Study of Prognosis. By Percy J. E. Gray and Harry Cushing. J. B. Lippincott Company, Philadelphia, 1918.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

RUDOLPH MATAS New Orleans, *President*

WALTER W CHIPMAN, Montreal *President Elect*

FRANKLIN H MARTIN Chicago *Director General*

MONTREAL COMMITTEE ON ARRANGEMENTS

ALFRED T. BAZIN *Chairman*

EDWARD B CHANDLER *Secretary*

WALTER W CHIPMAN

A MACKENZIE FORBES

ALBERT LASSALLE

EUGENE SAINT JACQUES

EDMOND M EBERTS

FRASER B GURD

DAVID W MACKENZIE

WILLIAM G TURNER

ALFRED FERRON

STEPHEN LANGEVIN

OSCAR F MERCIER

THE HOSPITALS OF MONTREAL

THE following brief sketches of the history and development of the hospitals of Montreal are published so that those who will attend the Clinical Congress of the American College of Surgeons in October may have some idea of Montreal's hospital facilities in advance.

The early hospitals of Montreal played an important part in the building of Canada and Canadian medicine, and the record of their pioneer struggles and achievements forms one of the most interesting and even thrilling chapters in the dramatic history of that country.

The story of the Hotel Dieu de Ville Marie, and of Jeanne Mance, its founder, is one with the history of the heroic foundation of Montreal in 1642 by M. Chomedey de Maisonneuve, which was the outcome of religious devotion and missionary fervor, of the spirit of commercial enterprise and of adventure.

The present Montreal General Hospital, on the other hand, founded in 1821, sixty years after the English conquest of Canada, through the philanthropy of the English speaking or Protestant part of the community, holds the high honor of having been at once the birthplace and the cradle, not only of Canadian medical education, but also of all higher university education in Canada. For, within its walls, through the youthful vigor, initiative, and organizing ability of its first medical staff, Drs. Caldwell, Holmes, Robertson, and Stephenson, who were all graduates of Scottish universities, and imbued with the traditions and standards of their schools, arose the Montreal Medical Institution, which became the Medical

Faculty of McGill University, and which not only fulfilled the conditions and saved the bequest of James McGill to the cause of education, but through nearly thirty strenuous years, developed the organization and carried on practically the entire work of this, the pioneer university of Canada.

The Montreal General Hospital has had the further distinction of having had on its pathological and clinical staff during the first ten years of his professional life, Sir William Osler. The large and valuable pathological collections which he made at this time were placed by him in the museum of McGill University and are to be seen there, practically intact, today. His original autopsy books, written entirely in his own hand, are also preserved there.

As in all growing cities, Montreal's hospital accommodation is far short of its requirements. But since the last congress there in 1920, there has been a very substantial increase in the size of several of the hospitals and some are in completely new buildings. "These buildings form a splendid record of the march of progress and an apt illustration of the truth that fidelity in the day of small things yields certain harvest, and that the foundations laid in the past by disinterested enthusiasm, integrity, sagacity, and exact knowledge, become the basis of a mighty superstructure beyond the ken, although perhaps not beyond the vision, of the builders of other years."

The Hotel Dieu has grown from approximately a 225 to a 300 bed hospital since 1920. "Old in years, it is up to date in spirit." The Montreal

General Hospital now has 400 beds, the Western Division, 100 additional beds, La Misericorde 600 beds and 175 cribs, Notre Dame 425 beds. In 1920 the Royal Victoria had 450 beds, it now has 700 beds available for teaching purposes. The Children's Memorial Hospital recorded 1274 admissions during 1925 and Sainte Justine expects to have a capacity of 336 beds by September of this year. Notre Dame Hospital is magnificently established in its new building on Sherbrooke Street East. The building faces beautiful Lafontaine Park. The Shriners' Hospital for Crippled Children has been built since the Congress of 1920.

The increased size of the buildings and the elaboration in equipment will expand both the interest of the conference and the variety of surgical clinics which can be held concurrently.

The historical resumes which follow are arranged chronologically, the basis being the date of foundation of the hospital.

THE HOTEL-DIEU

By LEO E. PARIZEAU M.D.

The Hotel Dieu is the oldest nursing institution on the continent barring one. It was founded nearly three centuries ago by Miss Jeanne Mance, the Florence Nightingale of America. Fired with religious zeal this young lady left France and a comfortable home to face the awful perils of the New World. At the port of La Rochelle she joined a party of fifty whose destination was the Island of Montreal where they intended establishing a mission for the Indians.

Miss Mance had been assured of ample financial support by the great benefactress Madame de Bullion. She landed on the Island in May 1642 with M. de Maisonneuve founder of our city. Her hospital was ready for occupation in 1644 and was soon filled to capacity, because of the continual onslaughts which were being made by the Iroquois.

In 1649 the young colony appeared to be doomed and its French patrons spoke of abandoning it. Miss Mance sailed for the mother country and won back support. When she returned to Canada matters were still worse and the hospital, in a perpetual state of siege on account of its position, had to be defended by a permanent garrison borrowed from the fort.

Our heroine, with great foresight, distracted part of the hospital's dowry for the purpose of increasing the defence of the settlement. One hundred men were recruited overseas. As a token of esteem the newly arrived soldiers enlarged the

hospital in 1654. It measured, originally, sixty feet long by twenty four feet wide.

Assisted only by two servants, the devoted nurse and superintendent remained at her post in spite of danger. In 1657 she fell and broke her arm. It was set by Bouchard, the first surgeon of Montreal who, unfortunately failed to notice that the wrist was luxated. Arthritis and neuritis soon brought about impotence. Sadly in need of help Mance sailed for France once more in 1659. She returned the same year with three sisters of an order recently founded and consecrated to the care of the sick in Canada. Les Hospitalières de St. Joseph.

Miss Mance died in 1673, after having devoted more than half of her life to the great institution she created. Since then the Sisters of St. Joseph have continued the work of mercy. In 1669 for services rendered to the French colony the Hotel Dieu was granted a charter by Louis XIV. The precious document is still in the hands of its beneficiaries. In 1760 Montreal fell to the English and the staff was called upon to nurse the enemy, whose gratitude is attested by many letters.

The first building with its additions, was destroyed by fire in 1695. Many treasures were lost most precious of all the heart of Mance. Fire again took toll in 1721 and in 1734. Complete reconstruction became necessary in 1861-1827.

In 1847 Irish immigrants brought the typhus to Montreal. The Sisters left their monastery and nursed the poor unfortunates in the sheds along the waterfront. In 1853 the Irish obtained an institution of their own, St. Patrick's. But it was soon found expedient to merge it with the Hotel Dieu and in 1861 the hospital moved from the old site on St. Paul Street to the present one at the foot of Mount Royal, adjoining Fletcher's Field now Mance Park. Here were built the very substantial structures that constitute one of the city's landmarks.

In 1901 a wing was added to provide greater accommodation for private cases. At the time of writing a large annex is nearing completion. The increase in bed capacity has been as follows:

Before 1825	32 beds at most
1826-1842	50 beds
1842-1861	100 beds
1861-1901	230 beds
1901-1925	268 beds
End of 1926	300 beds at least

Official connection with the School of Medicine and Surgery began in 1847. This school became in time a faculty of Laval, now known as the University of Montreal. The Hotel Dieu is one of the two large general hospitals open to the

French speaking medical students for clinical study. Much of the work is now done by lay nurses. Nearly three hundred of these met on the 18th of May to commemorate the twenty fifth anniversary of the foundation of their school, which is affiliated with the University. Their festivities coincided with the 284th anniversary of the Hotel Dieu and of Montreal itself.

The hospital has kept abreast of the times. Old in years it is up to date in spirit. Visitors will find it charmingly paradoxical.

In the pharmacy, the ampoules and triturates of our times face a magnificent array of ointment pots over two hundred years old. Adjoining the board room, where the latest periodicals can be consulted by the staff, one finds the record room where documents of great historical value are jealously guarded. A cardiograph, polygraphs, metabolism, and X ray apparatus for the patients, old pewter and curtained beds for the nuns. Dim lights in the sanctuary, "scalytiques" in the operating rooms. Prayers in Latin, lectures in French, convention papers in English. Letters patent from ministers long turned to dust and certificates of efficiency from the American Medical Association. A house of mercy founded for a settlement of fifty people preparing to meet the demands of a city of a million.

The Hotel Dieu is a hospital for every man, but it certainly is not Everyman's hospital.

THE MONTREAL GENERAL HOSPITAL

In 1822 the Montreal General Hospital first opened its doors. It had then a capacity of 72 beds. The original plans called for a central block with two wings, but at the time of opening only the central block had been built. It was heated by a furnace, a novelty in those days. The iron railing erected in front of the building is still in place. The staff consisted of a matron, two nurses, one house surgeon, and five medical attendants, four of whom were Edinburgh graduates.

It was not long before the attending physicians realized the desirability of opening a medical school in connection with the hospital, and through their efforts the Montreal Medical Institute was founded in 1824. This was the first medical school in Canada, and the Montreal General Hospital was the first hospital in this country to admit students to its wards. The four Edinburgh men on the staff were appointed lecturers in the medical school.

In September, 1827, owing to a lack of funds, the hospital found it necessary to curtail its activities. The nursing and domestic staff was reduced, and the services of the apothecary were dispensed with, two of the attending physicians taking over his work. This curtailment was, however, only temporary, and the hospital gradually resumed its former vigor.

In 1832 the east (or Richardson) wing was built, bringing the hospital capacity up to 100 beds. It is interesting to note that at this time major operations numbered only between thirty and forty a year, and minor operations consisted chiefly of bleedings.

The value of the hospital to the community was amply attested during the years of the cholera epidemic in 1832-1833, and during the typhus or ship fever epidemic in 1847. Not only was the hospital taxed to capacity, but extra accommodation was provided in sheds and tents erected in the neighborhood.

In 1848 the hospital was further enlarged by the erection of the west (or Reid) wing. This was the gift of Mrs. Reid, in memory of her husband, Chief Justice Reid, and was the first wing to be built by individual munificence.

In 1866 the land opposite the hospital was purchased by Mr. William Molson and Mr. J. G. Mackenzie, the dilapidated houses on it torn down, and the site given to the hospital as a recreation ground for doctors and nurses.

In 1868 an infectious disease hospital was built at the back of the east wing. This has since been torn down, but in its day, with a capacity of 40 beds, it was filled with typhus and smallpox patients, which were not the rarity that they are now.

In passing, it may be noted that the present day long wards were not then in vogue. Wards held usually from six to twelve patients. The nurses too, were of a different order. Training was unknown, it being generally held that nurses were born and not made. Stimulants were used rather freely for the revival of patients, and these were not infrequently taken by the nurse instead.

In 1874 the Morland wing was erected. This was situated back of the west wing and was devoted to the care of children.

About this time Osler returned from Europe and was given charge of the autopsy room, which under his supervision became a teaching center, with weekly demonstrations which were of much value.

This year, too, marks the appointment of the first specialist to the hospital, in the person of Dr. Frank Buller, oculist and aurist.

¹Abstracted from Dr. Shepherd's monograph, *The Origin and History of The Montreal General Hospital*.

In 1875 the out patient department, which had hitherto been housed in two rooms to the left of the main entrance and attended by the house surgeons, was reorganized. Newly elected out patient physicians and surgeons were put in charge and the basement under the Reid and Morland wings was arranged for the various sections. During the past ten or twelve years this department has grown tremendously and is now one of the largest on the continent.

In 1877 Dr Roddick spent some time under Lister in Edinburgh and returned with a full equipment of dressings and steam sprays. This marked the introduction into Canada of the new system of healing wounds. As a consequence, operations which previously had been avoided, owing to the certainty of infection were undertaken with success and medicine during the next ten years became largely surgical.

In 1881 the first medical superintendent Dr James Bell was appointed with an ample salary, and on the understanding that he should give full time to the hospital and not engage in private practice.

In 1882 the Greenshields, Campbell and Hamilton bequests enabled the hospital authorities to proceed with the erection of two surgical wings and the equipment of an up to date operating room. The wards were now for the first time divided specifically into two classes, medical and surgical, and specialization in the various branches was given new impetus.

In 1883 the first ambulance service was organized. The growth of this service is illustrated by the fact that in 1884 some 108 calls were answered while in 1914 over 2000 were answered.

In 1890 Miss Livingston became superintendent of nurses. Hitherto the nursing service had been of varying standards. The four trained nurses sent out by Miss Nightingale had done excellent work, but after their resignation because of friction with the senior medical resident there had been a reversion to the former standard of half trained nurses, and in consequence the administration had deteriorated. Under the supervision of Miss Livingston the department was reorganized and the training of nurses made systematic and adequate.

In 1894 the first pathological building was erected and the other buildings were renovated and remodeled.

In 1897 an electric plant was installed. The Nurses Home was also begun, the corner stone being laid by Lord Lister, who afterward gave the address to the nurses.

The year 1898 marks the installation of the X ray department, which has since been very greatly extended.

In 1909 the new pathological building was opened and the dental clinic inaugurated.

In 1911 plans were made for materially increasing the accommodations and equipment of the hospital and the corner stone of the new building was laid by the Governor General, Lord Grey. By 1914 some of these buildings were completed—three large medical wards, a children's ward, wards for specialties, and two flats for private patients, the accommodation thus being brought up to 400. There still remain to be built the west wing and the central portion of the proposed structure.

In 1911 too, the social service department began its work. This has gradually grown to be a very active department, especially in connection with the out patient clinics.

At present the new Nurses Home is under construction. It is situated on what was formerly the recreation ground in front of the hospital.

MISERICORDIA HOSPITAL

The idea of founding a community specially devoted to the rescue of that outcast of society the unmarried mother arose in the broad mind of the lamented Bishop Bourget, second bishop of Montreal, whose paternal solicitude for social and spiritual needs of every part of his flock was constant and keen. The co-operative agent so necessary for the execution of his plan was a widow, noble in heart and great in virtue and compassion. Madame Rosalie Jette, responding to the call of Divine Providence, made the sacrifice of severing family ties in order to place herself at the disposal of the large hearted prelate. The first institution of this kind in America was thus founded on January 16, 1848, and the new community received the name of Sisters of Misericordia.

From its humble beginning—a house of ten beds capacity—grew gradually the institution as it is today, a stone building three and four stories high located on Dorchester St. Hubert, LaGauchetière and St. Andrew Streets, covering almost the entire block and having a capacity of 600 beds (personnel included) with an infant department of 175 cribs.

The wing for obstetrical cases, for unmarried mothers only, has a capacity of 150 beds. As these patients are admitted a few months before confinement and remain some months after this department affords unusual opportunities for study.

in this branch of medicine. In 1850, an agreement was made with the Victoria School of Medicine of Montreal, and later in 1878, with Laval University, whereby medical students were allowed to attend clinics on obstetrics under the direction of competent professors.

In 1889 a department in pediatrics was organized under the supervision of the best specialists of that time. A milk laboratory was equipped. A pathological laboratory was also provided in 1898 for the necessary tests on patients and infants. This laboratory was later completed so that it meets all present day requirements and is conducted by a pathologist. An autopsy room was opened in 1901.

Until 1906, the training school for nurses was giving a course in obstetrics and pediatrics only. Regular affiliation with the University of Montreal took place and the course of study for nurses was regularly organized but was not extended to a three year course until 1922 when it was accredited by the Association of Nurses of the Province of Quebec.

A dispensary was opened in 1921, where every free case is examined, and anti venereal treatment given when necessary.

The latest building, modern in every way, erected in 1923 for private cases—surgical, medical, and obstetrical—offers the nurses a great opportunity for experience in these various branches of medicine. It can accommodate 50 patients. The same year saw the organization of the medical staff, according to the requirements of the American College of Surgeons. Meetings of the staff are regular and have resulted in marked progress for the member as well as for the hospital.

The institution is a private one, conducted by a religious order of the Roman Catholic denomination, supported partly, for public cases, by the city and by provincial subvention, and partly by voluntary contributions from benefactors. The private hospital for general cases of women supports itself, as these are private paying patients. Patients from various denominations are received without discrimination.

Statistics for the year 1925 show the following figures: free or partly paying patients admitted, 610, private patients, 689, infant department, 615, total, 1,914.

The school for nurses has 55 pupils and is affiliated with two hospitals for the training of the students in contagious and nervous diseases.

This institution which was so humbly begun in 1848 has given rise to twelve houses which are situated in various great centers of Canada and the United States.

WESTERN DIVISION OF THE MONTREAL GENERAL HOSPITAL

The Western Division of the Montreal General Hospital is one of the city's smaller institutions for the care of the sick. As its name implies, it is situated in the western part of the city on the intermediate level. It serves a large industrial area in the lower level in the same part of the city.

In 1874 the Hospital was founded as the Western Hospital of Montreal, in 1876 the Mills wing was built with a capacity of 32 beds. At that time in the history of the city the population on the upper levels was extremely small.

The first graduates of the Training School for Nurses received their diplomas in 1889. In 1907 the necessity for increased accommodation for the care of the sick and injured in the western part of the city, resulted in the building of what was, at that time, a more modern hospital with a capacity of 80 beds. In 1921 a modern nurses' home was opened, and the following year the addition of a children's ward raised the capacity of the hospital to 100 beds.

Amalgamation of the Montreal General Hospital and the Western General was brought about in 1924, and the latter institution received the name of the Western Division of the Montreal General Hospital.

Although a small institution, its services, both indoor and outdoor, are extremely active. In 1925, admission to the Indoor Department numbered nearly two thousand with over thirty-one thousand hospital days. The outdoor department registered approximately twenty seven thousand consultations.

NOTRE DAME HOSPITAL

The Notre Dame Hospital, a French Canadian and Catholic institution, is magnificently established on Sherbrooke Street East, facing La Fontaine Park, one of the finest parks of the city. It contains 425 beds, of which 300 are in Notre Dame Hospital proper and 125 in the section for contagious diseases, the St. Paul Hospital.

It was in 1880, forty six years ago, that the Notre Dame Hospital was founded and opened its doors to the sick, on Notre Dame Street East, under the most modern beginnings. Situated in the center of what was then the commercial and industrial district of the city, in proximity to the harbor which already showed signs of the activity which has since made it one of the largest harbors of the world, and at an equally short distance from the newly organized French medical school on Jacques

Cartier Square, the site of the hospital met the two desiderata of its founders, to render the most service possible to the laboring class of the population and supply a field of clinical observation to the students of Laval Medical School.

Evidently the hospital came at the proper time, for it succeeded immediately in gaining the good will of the public.

The number of beds 25 at the opening soon grew to 50, 75 and 100 without ever satisfying the demand. Accidents of various kinds supplied the greatest part of the work, so that those interested in general surgery at once became very busy in both the outdoor departments and the public wards. Five years later it became necessary to secure ambulances to convey from all quarters the numerous wounded who wished to be treated at the hospital. God alone knows the great number of these unfortunates whom the ambulances of Notre Dame have for over 40 years carried as quickly as possible from all parts of the city to the hospital to receive the immediate care their conditions required.

But as the years passed on the hospital kept adding to its bed capacity and its outdoor departments. The Reverend Grey Nuns who contributed to the founding of the hospital and who ever since have had the direction and care of the patients could not carry on the work alone longer. A school for lay nurses was then established and has constantly supplied the hospital since with devoted and competent nurses. At present the school has over 100 students under the direction of the Reverend Sisters.

In the year 1903, by a special contract with the City of Montreal the Notre Dame Hospital undertook the care of patients suffering from contagious diseases: diphtheria, scarlet fever, measles, erysipelas etc. and organized an annex called the St. Paul Hospital where hundreds of children are treated every year.

In the meantime Notre Dame was completing its organization as a modern general hospital. Nothing that could benefit the patients was spared. Laboratories and X-ray departments were added. The main departments: surgery, medicine, gynecology, ophthalmology, otorhinolaryngology, pediatrics and neurology were all working to full capacity but were unable to keep pace with the demand.

In 1920 the Notre Dame hospital had 157 beds and was treating yearly about 3,000 patients in the hospital and 12,000 in its out-patient department. The medical staff included 50 physicians and surgeons, many of them professors in the University of Montreal. For a number of years it has

been apparent that the hospital was too small and not properly located to meet the needs of the population. Hundreds of patients were being refused admission to the hospital each year for the lack of beds. Something had to be done and it was then that an active and devoted board of directors decided to reconstruct the hospital on another and better site. Work was begun in 1921, and completed in the summer of 1924. Today Notre Dame Hospital occupies one of the finest sites in the city in an absolutely modern and fireproof building notable for its exposure to the light and sun on four sides.

The institution is one of the most important of the city. The annual report for the year 1925 tells us that about 5,000 patients have been treated in the hospital during the year, with a total of 90,000 days of hospitalization, besides the 40,000 free consultations given in the out-patient department. The number of sick patients seeking admission to the hospital is so great that already the new building is found too small, so that the board of directors is now planning to enlarge it to a capacity of 500 to 550 beds.

The medical staff of the hospital has made a splendid reputation for itself, and with the facilities of enlarged buildings Notre Dame will rank among the best hospitals of the city of Montreal.

ROYAL VICTORIA HOSPITAL

The Royal Victoria Hospital was founded and endowed by the late Lord Mount Stephen and Lord Strathcona, two distinguished citizens of Montreal, for the relief of the suffering poor and the advancement of the arts of healing. The site chosen was on the slope of Mount Royal overlooking the city.

The buildings are marked by spacious hall and splendid equipment. The hospital with a capacity of 200 beds was opened for the reception of patients in January, 1894, and the Pathological Building was opened in October of the same year. The policy of the hospital has always been one of expansion in scientific work and in hospital accommodation. In a very few years the capacity increased to 300 beds and two floors were arranged for private patients.

In 1916 the Ross Memorial Pavilion of 120 rooms for private patients with X-ray and physiotherapy departments was opened. In 1920 the new out-patient building was completed. In 1924 the University Medical Clinic was founded, and in the same year the new Pathological Institute was built in conjunction with McGill University.

In June, 1926, the Royal Victoria Montreal Maternity building with a capacity of 250 beds was opened for the reception of patients.

Clinical and research work is carried on in all departments, and there are now nearly 700 beds available for teaching purposes.

CHILDREN'S MEMORIAL HOSPITAL

The Children's Memorial Hospital was founded in 1902 to perpetuate the memory of Queen Victoria, and was called the Children's Memorial Hospital to Queen Victoria. The large number of cripples, who were seen on the streets begging help or endeavoring to earn their living by peddling, suggested the need of a hospital especially adapted for the treatment of children suffering from conditions, which, if neglected, would lead to permanent deformity.

It was the desire of the committee of organization to build a small hospital on the slopes of Mount Royal, or just outside the city. It was to be large enough to house comfortably 12 to 15 children to be used primarily for cripples, but, if there happened to be vacancies, patients with other surgical or medical affections were to be admitted. The hospital was to be built with a view to later expansion, but at the time it was founded, the object was to treat the class of patients who required the curative effect of the sun. For this reason, the plans of the hospital provided very elaborately for large galleries, open air pavilions, and sun parlors where sun treatment might be carried out to perfection. The finished institution is to consist of cottages, pavilions, and buildings which will be connected by a long corridor. The hospital buildings as originally planned formed the shape of a horseshoe starting with the out patient department and ending with the school. These were the aims of the committee of organization.

In 1903, they were able to secure temporary quarters at 500 Guy Street, and here it was that the pioneer institution known as the Children's Memorial Hospital opened its doors to treat crippled children, and for several years the institution was located there. The Guy Street house, having been built for a private family, was inadequate in many ways as a hospital. However, it served the purpose for the beginning of the work.

The first patient entered the hospital, January 30, 1904. In May, 1905, the number of patients had increased to 36. During the first year 123 resident patients and 195 non resident patients were treated.

Although the walls of the little house appeared to be elastic the time soon came when they could stretch no further and the committee after much forethought secured the spot on the mountain side where the hospital now stands. It was decided that, owing to lack of funds, only a wing of the administration building should be constructed and that it should be used for the hospital. The building was to provide for 45 children, with ample living quarters for the nurses.

The hospital had not been open a year before a department of education was introduced. A teacher was employed to teach the children who were confined to bed. This idea gradually broadened until the School for Crippled Children was built beside the hospital.

In the year 1913 the Arnott Cottage was opened and used as an infant ward. Necessity gradually forced the hospital to become a general hospital for children. During the year 1920 it became a recognized teaching hospital in association with McGill University.

The year 1920 also marked the opening of the new James Carruthers Building which greatly increased facilities for the care of non resident patients and made possible extensive expansion in the physiotherapy department. Until 1921 small clinics were being held twice a week in the School for Crippled Children. In that year, a large room in the new building was given over to this department and complete apparatus was installed.

There are five other buildings on the hospital grounds which should be mentioned. The first of these is the James Carruthers Hut which is outfitted to care for children in the open air for the entire year, then there is the James Carruthers Corridor which is a beautiful sunshiny corridor providing for the ward above a very spacious open air gallery. In 1924 the Kiwanis Club of Montreal donated a second open air pavilion. The next building is the Kindmond Cottage which is to become the new infant ward. This year the Judah Hut is being opened. This is a small pavilion accommodating 12 patients.

From the hospital's report for the year 1925, one learns that 1,774 resident patients were treated that year all but 55 coming from the city of Montreal. In the out patient department 19,040 patients were treated.

SAINTE JUSTINE HOSPITAL

Sainte Justine Hospital was founded in 1907, with a capacity of 10 beds and a medical staff of 4 doctors and was exclusively reserved for children from their birth until the age of 12 years. In 1913,

a first extension was provided, bringing the number of beds up to 80. In 1922, a second extension was inaugurated giving a total of 170 beds and this month the final wing of the building will be completed providing a total capacity of 336 beds.

Sainte Justine Hospital is governed by three boards—an executive committee under the direction of a group of distinguished women of Montreal, a medical board of 40 doctors and 10 internes and a nursing department under the supervision of 40 Sisters aided by 60 lay nurses.

In September next Sainte Justine Hospital will be provided with a school for crippled children and an obstetrical service, permitting the teaching of prenatal care. Apart from the ward clinics where during the last year, 1,380 orthopedic and surgical operations were performed it has an extensive outdoor department which in 1925 gave 18,000 consultations and a social service of considerable importance.

SHRINERS HOSPITAL

The Shriners' Hospital for Crippled Children, Montreal Unit, is one of a chain of hospitals built and maintained by the Shriners of North America. It is the only one in Canada and was officially opened on February 18, 1925. The cost was approximately \$483,000.00. The capacity is 50 beds for surgical cases. It is modern in every

way, being fireproof, and supplied with the most modern equipment in every department. In addition to surgical wards it has a pathological laboratory fully equipped for research work.

There are two wards of 25 beds each which are laid out in the cubicle system, every child having individual equipment. There is a solarium on each ward and a large balcony so that every child can be out in the sunshine and fresh air.

The hospital is for the indigent cripple and is absolutely free, the only restrictions being that the child is not mentally defective and not over 14 years of age, also, that the parents or guardians cannot afford to pay for hospital treatment. The parents provide railway fare to and from the hospital and money for braces or boots when they are ordered. There are no restrictions as to race, creed, or district. Our patients come from any part of Canada or the United States. We have had patients from as far distant as Washington and Chicago. Many come from New Brunswick and Nova Scotia as well as from nearer points.

At present we have a waiting list of 45, and just as soon as we have an empty bed we send for another patient. The types of cases treated include such conditions as poliomyelitis, spastic paralysis, cleft palate, harelip, bow legs, club feet, malunited fractures, congenital deformities and tuberculosis of bones and joints. The average stay of a patient is about 3½ months.

THE SIXTEENTH ANNUAL CLINICAL CONGRESS IN MONTREAL

THE clinical program for the sixteenth annual Clinical Congress of the American College of Surgeons to be held in Montreal, October 25-29, as published in following pages has been largely revised in recent weeks and is to be still further revised and amplified during the weeks preceding the Congress, so that the final program of clinics and demonstrations as prepared by the Committee on Arrangements will adequately represent the clinical activities of Canada's great medical center. All departments of surgery will be represented therein, including general surgery, gynecology, obstetrics, orthopedics, urology, surgery of the eye, ear, nose, throat, and mouth.

The Committee on Arrangements also has in preparation a series of "dry clinics" to be given each afternoon in Windsor Hall at the Windsor Hotel, with the exception of the session on Wednesday afternoon, which will be held at the University of Montreal. The program will be a varied one, in which our distinguished visitors from abroad, and eminent surgeons of the United States and Canada, will participate.

Also, the committee is preparing a program of clinical demonstrations that will be of special interest to the visiting surgeon whose work is confined to surgery of the eye, ear, nose, and throat.

Those who attended the 1920 session of the Clinical Congress in Montreal will remember the excellent clinical program provided, and one may confidently expect, judging from the preliminary program, a larger and still more interesting series of clinics at this year's meeting. Since 1920 a number of hospitals have been built and additions made to the older hospitals, so that Montreal's clinical facilities have been greatly increased. Clinics and demonstrations are to be given in the following institutions: McGill University and University of Montreal medical schools, the Children's Memorial Hotel Dieu, Misericordia, Montreal General, Notre Dame, Royal Victoria, St. Justine, and Shriners' Hospitals.

EVENING MEETING

At the Presidential Meeting on Monday evening in Windsor Hall, the first formal session of the Congress, the President Elect, Dr. Walter W. Chipman of Montreal will be inaugurated and deliver the annual address. Another important feature on that evening's program will be the John B. Murphy oration on surgery.

Programs for the scientific sessions in Windsor Hall on Tuesday, Wednesday, and Thursday evenings, now being arranged by the Executive Committee, will include a number of papers dealing with important surgical subjects of present day interest to be read and discussed by eminent surgeons of the United States and Canada, and by distinguished surgeons from abroad.

Among the distinguished visitors from foreign countries who will present papers are the following: John M. C. Fraser, M.D., F.R.C.S. (Edin.), Regius Professor of Clinical Surgery in the University of Edinburgh, Archibald Young, M.B. C.M., F.R.F.P.S., Regius Professor of Surgery in the University of Glasgow, Professor Roberto Alessandri of Rome, D.P.D. Wilkie M.D. F.R.C.S. (Edin.), Professor of Surgery in the University of Edinburgh, W. Simpson Handley, M.S., F.R.C.S., of London, L.E. Barnett, M.B., C.M., F.R.C.S., of Dunedin, New Zealand.

On Friday evening at the fourteenth annual convocation of the College in Windsor Hall a large class of candidates for Fellowship in the College will be received.

HOSPITAL CONFERENCE

The first two days of the Congress will be devoted to conferences on the problems related to the hospital standardization program of the College and will be of particular interest to surgeons, hospital trustees, executives and personnel generally. These conferences will be held in Windsor Hall. The complete program for the hospital conference will be published in the October issue of this journal.

A hospital information and service bureau, to give assistance to hospitals in the solution of their problems, will be maintained at headquarters throughout the session. An invitation is extended to all persons interested in the hospital field to attend these conferences.

HEADQUARTERS AND HOTELS

General headquarters for the Congress will be established at Windsor Hotel on Dominion Square, which hotel is now under the same management as the Waldorf Astoria in New York, the Bellevue Stratford in Philadelphia and the New Willard in Washington. Windsor Hall, Rose Blue and Oak rooms, and other large rooms and foyers located on the ground floor have been reserved for the exclusive use of the Congress.

The five principal hotels of Montreal as listed below afford accommodations for fully 3,000 persons. The number of single rooms available is limited and it is expected that the visiting surgeons will arrange to use double bedded rooms sharing accommodations with associates or friends. Since the 1920 session in Montreal a new hotel has been erected the Mount Royal on Peel Street, two blocks north of the Windsor Hotel, with upwards of one thousand rooms. All of the hotels listed with the exception of the Place Viger are within short walking distances of headquarters.

MONTREAL HOTEL RATES

	Minimum Rates	
	Single Room	Double Room
Windsor with bath	\$4.00	\$7.00
with running water	3.00	5.00
Mount Royal with bath	4.00	7.00
Ritz Carlton with bath	6.00	10.00
Queens with bath	4.00	6.00
with running water	2.50	5.00
Place Viger with bath	4.00	8.00
without bath	3.00	5.00

REDUCED RAILWAY FARES

The railways of the United States and Canada have authorized reduced fares on account of the Montreal session of the Clinical Congress so that the total fare for the round trip will be one and one half the ordinary first class one way fare. To take advantage of the reduced rates it is necessary to pay the full one way fare to Montreal procuring from the ticket agent a 'convention certificate' when purchasing the ticket, which certificate is to be deposited at headquarters for the use of the special agent of the railway companies. Upon presentation of valid certificate to the ticket agent in Montreal not later than November 2 a ticket for the return journey by the same route as traveled to Montreal may be purchased at one half the regular one way fare.

In the Eastern central and southern states and eastern provinces of Canada tickets may be purchased between October 21 and 27 in south western and western states between October 19 and 25 and in the far western states and western provinces of Canada between October 15 and 21. The return journey from Montreal must be begun not later than November 2.

The reduction in fares does not apply to Pullman fares, nor to excess fares charged for passage on certain trains. Local railroad ticket

agents will supply detailed information with regard to rates, routes, etc. Stop-overs on both the going and return journeys may be had within certain limits.

Full fare must be paid from starting point to Montreal and it is essential that a 'convention certificate' be obtained from the agent from whom the ticket is purchased. These certificates are to be signed by the general manager of the Clinical Congress and vised by a special agent of the railroads in Montreal during the meeting. No reduction in railroad fares can be secured except in compliance with the regulations outlined and within the date specified. It is important to note that the return trip must be made by the same route as used to Montreal and that the certificate must be presented and return ticket purchased not later than November 2.

LIMITED ATTENDANCE

Attendance at the Montreal session will be limited to a number that can be comfortably accommodated at the clinics. The limit of attendance being based upon the result of a survey of the amphitheatres, operating rooms and laboratories in the hospitals and medical schools as to their capacity for accommodating visitors. Under this plan it will be necessary for those who wish to attend to register in advance. When the limit of attendance has been reached through such advance registration no further applications will be accepted.

Attendance at clinics and demonstrations will be controlled by means of special clinic tickets which plan has proved an efficient means of providing for the distribution of visiting surgeons among the several clinics and insures against overcrowding. The number of tickets issued for any clinic is limited to the capacity of the room assigned to that clinic.

REGISTRATION FEE

A registration fee of \$5.00 is required of each surgeon attending the annual Clinical Congress, such fees providing the funds with which to meet the expenses of the meeting. To each surgeon registering in advance a formal receipt for the registration fee is issued, which receipt is to be exchanged for a general admission card upon his registration at headquarters during the meeting. This card which is nontransferable must be presented to secure clinic tickets and admission to the evening meeting.

PRELIMINARY CLINICAL PROGRAM—GENERAL SURGERY, GYNECOLOGY, OBSTETRICS, ORTHOPEDICS, UROLOGY

ROYAL VICTORIA HOSPITAL

Tuesday

EDWARD W ARCHIBALD and staff—9 General surgical clinic

D W MACKENZIE and staff—9 Urological clinic operations and demonstration of cases

Wednesday

C B KEENAN and staff—9 General surgical clinic

W G TURNER and W J PATTERSON—9 Orthopedic clinic, operations and demonstration of cases

Thursday

F A C SCRINGER and staff—9 General surgical clinic

D W MACKENZIE and staff—9 Urological clinic, operations and demonstration of cases

Friday

FRANCIS C MCKENTY and staff—9 General surgical clinic
W G TURNER and W J PATTERSON—9 Orthopedic clinic, operations and demonstration of cases

ROYAL VICTORIA HOSPITAL—MONTREAL MATERNITY PAVILION

Tuesday

W W CHIPMAN and H M LITTLE—9 Gynecological and obstetrical clinic operations and demonstration of cases

Wednesday

H C BURGESS and J R FRASER—9 Gynecological and obstetrical clinic operations and demonstration of cases

Thursday

J R GOODALL and J W DUNCAN—9 Gynecological and obstetrical clinic operations and demonstration of cases

Friday

W W CHIPMAN and W A G BAULD—9 Gynecological and obstetrical clinic operations and demonstration of cases

ROYAL VICTORIA HOSPITAL—PATHOLOGICAL INSTITUTE

Wednesday

E H MASON—9 Pre-operative preparation of the diabetic patient with discussion of so-called diabetic gangrene

J C MEAKINS—9 Medical indications for splenectomy
Respiratory abnormalities in regard to the operative risk

D S LEWIS—9 Relation of hypertension to surgical risk
C F MOFFATT—9 Relation of cardiac disease to surgical operative risk

Thursday

DAVID BALLON—9 The bronchoscopic injection of lipiodol as an aid to X ray diagnosis of pulmonary lesions
Combined bronchoscopic and X ray demonstration

A H PIRIE—9 Demonstration of lungs injected with lipiodol in bronchiectasis and other diseases Normal abnormalities of bones

E C BROOKS—9 Report on 100 cases in which tetra iodophenolphthalein was given by mouth, with operative and other findings

Friday

E W ARCHIBALD F A C SCRINGER D ROSS GAVIN MILLER, JOHN ARMOUR—9 Experimental surgery

MONTREAL GENERAL HOSPITAL

Tuesday

H M LITTLE—9 Operations Ectopic gestation, pelvic inflammations

F J TEES—9 Demonstration Injury to elbow with late ulnar nerve lesion (5 cases)

E M EBERTS—10 Demonstration Unusual types of thyroid disease two cases of acute traumatic tension pneumothorax

F J TEES and F B GURD—10 Fracture clinic

A T BAZIN—10 30 Operations Gall bladder disease carcinoma of rectum

L J RHEA and associates—10 30 Clinical pathological conference

J G W JOHNSON—11 Cranial injuries

J A NUTTER—2 Orthopedic clinic, operations for paralytic deformities

F J TEES and F B GURD—2 Fracture clinic

L H MCKIM—3 Operative treatment of infections and compound injuries of hand and upper extremity

Wednesday

F S PATCH and R E POWELL—9 Operations Prostatectomy, nephrectomy

F J TEES—9 Demonstration Fractures of ankle and wrist

A T BAZIN—10 Demonstration Suppurative joint lesions

F J TEES and F B GURD—10 Fracture clinic

E M EBERTS—10 30 Operations Radical cure of inguinal hernia by infolding muscular stitch, under local anesthesia excision of caecum for carcinoma

L J RHEA and associates—10 30 Clinical pathological conference

C K P HENRY—11 Demonstration End results of splenectomy in pernicious anemia

J A NUTTER—2 Orthopedic clinic, operations for congenital deformities

F J TEES and F B GURD—2 Fracture clinic

W L BARLOW—3 Excision of tongue for carcinoma

Thursday

- H M LITTLE—9 Gynecological operations for repair of birth injuries
 F B GURD—9 Demonstration Fractures of femur and patella
 L H MCKIM—10 Demonstration Wound infection in appendicitis
 F J TEES and F B GURD—10 Fracture clinic
 A T BAZIN—10 30 Operations Radical cure of hernia by fascial graft carcinoma of colon
 L J RHEA and associates—10 30 Clinical pathological conference
 J A NITTER—11 Demonstration Backache sciatica sacro iliac and lumbosacral lesions and spondylitis thesis

Friday

- I S PATCH and R E POWELL—9 Urological operations
 A T BAZIN—9 Demonstration Bone tumors
 F J TEES and F B GURD—10 Fracture clinic
 E M EBERTS—10 30 Operations Thyroidectomies
 L J RHEA and associates—10 30 Clinical pathological conference

WESTERN DIVISION

- F B GURD and associates—9, daily General surgical and gynecological operative clinics
 I B GURD and associates—2 daily Demonstrations of end results on fractures of the ankle tibia and fibula femur humerus etc

NOTRE DAME HOSPITAL

Tuesday

- O F MERCIER U GARIEPY and L BLAGDON—9 Fracture clinic Presentation of a personal technique and instrument for temporary metallic osteosynthesis demonstration and report of cases
 T PARIZEAU J A DEMERS and O A GAGNON—9 Surgery of the gall bladder operations and demonstration of specimens
 L DE L HARWOOD A ETHIER R TRUDEAU H AUBRY and L GERIN LAJOIE—9 Gynecological clinic Operations and demonstration of cases
 E A RENÉ DE COTRET and staff—9 Obstetrical clinic Puerperal infection bedside work, demonstrations
 J A PANNETON—9 X ray demonstration routine work with exhibition of special technique and films Iodikon in gall bladder diseases lypiodicon in bronchial and lung diseases
 DR BELLEROSE and staff—9 Routine work of out patient department
 NOÉ FOURNIER—9 Urological out patient clinic

Wednesday

- L DE L HARWOOD A ETHIER R TRUDEAU H AUBRY and H GERIN LAJOIE—9 Gynecological clinic
 B G BOURGEOIS and O MERCIER JR—9 Urological operations suprapubic cystostomy and prostatectomy anesthesia in urology
 E A RENÉ DE COTRET and staff—9 Obstetrical clinic
 O F MERCIER U GARIEPY and L BLAGDON—9 Fracture clinic demonstration of apparatus on different cases
 J A PANNETON—X ray demonstration routine work with exhibition of special technique and films Iodikon in gall bladder diseases lypiodicon in bronchial and lung diseases

DR BELLEROSE and staff—9 Routine work of out patient department

NOÉ FOURNIER—9 Urological out patient clinic

Thursday

- L PARIZEAU C A GAGNON and J A DEMERS—9 Surgical operations Gastro enterostomy appendectomy
 L DE L HARWOOD A ETHIER R TRUDEAU H AUBRY and L GERIN LAJOIE—9 Gynecological clinic
 B G BOURGEOIS and O MERCIER, JR—9 Importance of the catheterization of the ureters in tests of renal function demonstration of cases
 O F MERCIER U GARIEPY and L BLAGDON—9 Abdominal complications in status of right hemicolectomy Operations Sympathectomy blood transfusion
 J N ROY—9 Dry clinic, plastic surgery
 J A PANNETON—9 X ray demonstration routine work with exhibition of special technique and films Iodikon in gall bladder diseases lypiodicon in bronchial and lung diseases
 DR BELLEROSE and staff—9 Routine work of outpatient department
 NOÉ FOURNIER—9 Urological clinic outpatient department

MISERICORDIA HOSPITAL

Tuesday

- STEPHEN LANGEVIN—9 White asphyxia and cerebral injuries
 H LEHEL—10 Protection of child in breech extraction
 L JUTRAS—11 Pernicious anemia and blood transfusion

Wednesday

- D MARION—9 Control of eclampsia by intravenous injection of somnifene
 D RICARD—10 Syphilis and pregnancy
 STEPHEN LANGEVIN—11 Cranial injuries

Thursday

- STEPHEN LANGEVIN—9 Hirudo medicinalis (leeches) in femoral thrombophlebitis
 P GAUTHIER—10 Emetic vomiting and blood grouping
 D MARION—11 Eclampsia and cesarean section radical treatment

ST JUSTINE HOSPITAL

Tuesday

- A FERRON Z CREPEAULT and J H RIVARD—9 Operative clinic Harelip undescended testicle scoliosis

Wednesday

- E DUBÉ A FERRON and J H RIVARD—9 Operative clinic Congenital dislocation of the hip congenital hernia Pott's disease

Thursday

- A FERRON Z CREPEAULT and E DUBÉ—9 Operative clinic Cleft palate prolapse of rectum correction of club feet

HOTEL DIEU HOSPITAL

Tuesday

- PIERRE Z. RHEAUME and JOSEPH A. St. PIERRE—9 Surgical operations. Appendectomy for appendicitis, chronic and pylic acid; cholecystectomy; entero-anastomosis. Hysterectomy; fracture of the femur; fracture of the tibia. DeBor's walking gait.
- EUGENE St. JACQUES, DONALD A. HINGSON, and WILLIAM J. DEROZEE—2 Clinical demonstration. Trauma of the hip. Heliotherapy in the treatment of osseous tuberculosis as practiced at Leiden and De Bore's Switzerland. Plaster band, clinical pathology, limited indications and multiple contraindications of uterine curette. Leo PARIZAC—2 X-ray demonstration.

Wednesday

- EUGENE St. JACQUES, DONALD A. HINGSON, and WILLIAM J. DEROZEE—9 Surgical operations. Demonstration of the advantages of the Reverdin needle and self retractors in diminishing the number of assistant hysterectomy for fibroma hysterectomy for leiomyoma; intramedullary, intracapsular, and extra-capsular fracture of the patella; DeBore's method.
- PIERRE Z. RHEAUME, JOSEPH A. St. PIERRE, and Professor BARR, LORRAIN—9 30 Clinical demonstration. Intratesticular tubercular fracture of the os pubis; ovarian conservation; uterine fibroma and pregnancy; third pathology; some clinical aspects of epicondylar value of the Ashard test in estimating the kidney function.

Thursday

- EUGENE St. JACQUES, DONALD A. HINGSON, and WILLIAM J. DEROZEE—9 Surgical operations. Appendectomy; cholecystectomy; gastro-enterostomy; hysterectomy; in rectomy; application of starch bandages in trauma of the forearm. DeBor's walking gait in fracture of the leg.

SURGERY OF THE EYE, EAR, NOSE, AND THROAT

HOTEL DIEU HOSPITAL

Tuesday

- ALBERT LABAILLE—2 30 Dacryocystorhinostomy (Dupuy-Dutenay technique) operation followed by demonstration with lantern slides.
- F. BADEAU—2 30 A rare case of conjunctivitis, with discussion.

Wednesday

- J. P. E. BOUSQUET—2 30 A new method of operation on the facial and ethmoidal sinuses operation under local anesthesia.
- G. BADEAU—2 30 Twenty cases of thrombophlebitis of the facial vein, with discussion.

Friday

- ALBERT LABAILLE—2 30 Reconstruction of the labial and dental defects—epidermic graft demonstration with lantern slides.
- J. P. E. BOUSQUET—2 30 Ocular muscular imbalance demonstration with lantern slides.

Friday

- PIERRE Z. RHEAUME and JOSEPH A. St. PIERRE—9 Surgical operations. Prostatectomy; removal of stones in the bladder; intestinal resection; nephropexy; nephroscopy for stones in kidney; hysterectomy; appendectomy.

CHILDREN'S MEMORIAL HOSPITAL

Tuesday

- A. MACKENZIE FORBES, R. DEROZEE, K. CAMERON, and F. YOUNG—10 Operations. Cleft palate; hernia. Demonstration. Application of extension in fracture; application of extension in tuberculous hip.

Wednesday

- A. MACKENZIE FORBES, R. DEROZEE, K. CAMERON, and F. YOUNG—10 Operations. Tendon transplantation; reduction of congenital dislocation of hip. Demonstration. Scissors and the treatment.

Thursday

- A. MACKENZIE FORBES, R. DEROZEE, K. CAMERON, and F. YOUNG—10 Operations. Harlow osteotomy; correction of deformities due to club feet. Demonstration. Routine examination of children suffering from tuberculous bones and deformities following acute infectious polyarthritis.

Friday

- A. MACKENZIE FORBES, R. DEROZEE, K. CAMERON, and F. YOUNG—10 Operations. Tonsillectomy; correction of deformities due to neck. Demonstration. Preparation of plaster bandages and their proper application.

MONTREAL GENERAL HOSPITAL

Tuesday

- H. D. HAMILTON and staff—9 Nose and throat clinic operations and demonstration of cases.
- G. E. HODGE and A. HENRY—2 30 Bronchoscopy clinic, demonstration of cases.
- C. J. STEVART—2 30 Tonsillectomy under gas anesthesia.

Wednesday

- G. H. MATHEWSON and S. H. McKEE—2 30 Eye clinic operations.
- H. BABY—2 30 Zinc ionization in chronic ophthalmia technique and demonstration of cases.
- A. E. LYNDON—2 30 Vocal processes (Larynx slide demonstration).
- J. B. GALLAGHER—2 30 Brain abscess.

Thursday

- H. D. HAMILTON and staff—9 Nose and throat clinic, operations and demonstration of cases.

Friday

- G H MATHEWSON and S H McKEE—2 30 Eye clinic
 A W FURNESS—2 30 Labyrinthine tests as an aid in
 diagnosis of intracranial lesions demonstration of cases
 A O FREEDMAN—2 30 Salivary gland tumors

ROYAL VICTORIA HOSPITAL

Tuesday

- DAVID H BALLON—2 Use of lipiodol in pulmonary diag-
 nosis by the bronchoscopic method
 WILLIAM J McNALLY—2 Experimental work on labyrinth
 G EDWARD TREMBLE—2 Nasal prosthesis
 Staff—2 Eye clinic slit lamp demonstration

Wednesday

- E HAMILTON WHITE—2 Tonsillectomy with demonstra-
 tion of intratracheal anesthesia

- J T ROGERS—2 Immediate skin graft in radical mastoid
 radical maxillary sinus operation under local anes-
 thesia
 A G McAULEY—2 Cryptic intra-ocular sarcomata lan-
 tern slide demonstration
 J A MACMILLAN—2 Wound infections of the eyeball
 lantern slide demonstration

Friday

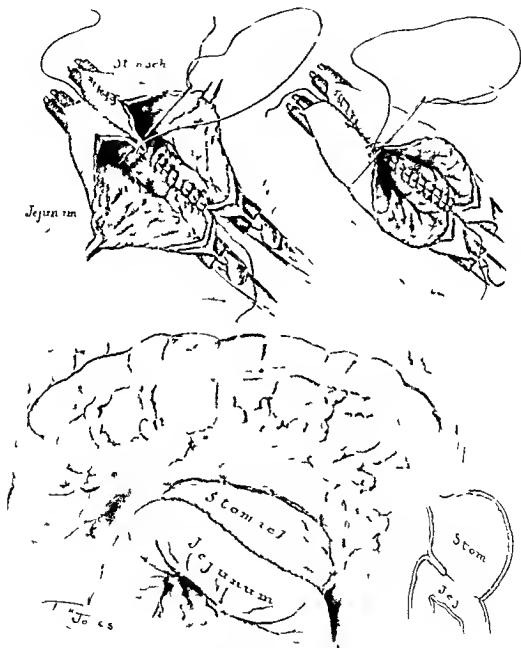
- Prof H S BIRKETT E H WHITE J T ROGERS D H
 BALLON G E TREMBLE K HUTCHISON WILLIAM J
 McNALLY—2 Ear nose and throat clinics operations
 and demonstrations of cases
 Staff—2 Eye clinic slit lamp demonstration Notre
 Dame Hospital
 J N ROY Melanosarcoma of limbus Technique for
 saddle nose
 P PANNETON Technique of hearing test Case of cataract
 extraction (combined) by trauma
 J BRALY Case of lipoma of the bulbar conjunctiva

LUKENS PICTORIAL TECHNIQUE

STOMACH SERIES

E RESECTION OF THE STOMACH (POLYA)

Third Fourth and Fifth Step



Sutures with a Reputation

Reprint of the plate may be obtained gratis by addressing
RESEARCH DIVISION, C. DEWITT LUKENS CO., 4908 Iacole Ave., St. Louis, U. S. A.

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XLIII

OCTOBER, 1926

NUMBER 4

GUNSHOT INJURIES OF THE BRACHIAL PLEXUS¹

By LEWIS J. POLLOCK, M.D., CHICAGO

Associate Professor, Nervous and Mental Diseases, Northwestern University Medical School

THE brachial plexus is formed by the union of the anterior divisions of the fifth, sixth, seventh, and eighth cervical nerves and of the first dorsal nerve. The anterior division of the fifth cervical unites with that of the sixth to form a common trunk, or primary cord, called the upper primary trunk. The anterior divisions of the eighth cervical and of the first dorsal unite to form the lower primary trunk. Between the upper and lower primary trunks the anterior division of the seventh cervical alone forms the middle trunk.

Each of these anterior divisions of cervical and thoracic nerves subdivide into anterior and posterior branches, the anterior branches of the fifth, sixth and seventh unite to form the upper external or outer cord, from which originate the musculocutaneous nerve and the outer head of the median nerve, the anterior branches of the eighth cervical and first thoracic nerves unite to form the internal cord of the plexus and from it originates the ulnar nerve, the internal and lesser internal cutaneous nerves and the inner head of the median nerve. The posterior branches of all of the nerves unite to form the posterior cord of the plexus from which originate the musculospiral and circumflex nerves.

The brachial plexus may be divided topographically into the roots, the trunks or primary cords (before and after the division into the anterior and posterior branches), the secondary cords and the peripheral nerves.

We have become accustomed to a simple classification of brachial plexus lesions in civil practice. This was possible because the majority of injuries, occurring either as the result of trauma at birth or trauma produced by dislocation of the humerus and traction of the plexus, have produced lesions of certain parts of the plexus in a constant manner peculiar to the particular injury. Such injuries have been classified as complete and incomplete. Of the incomplete forms the upper brachial plexus palsy, or Erb's palsy, has been the most frequent. This is produced by a lesion of the fifth and sixth cervical roots and results in a paralysis of the deltoid, biceps, brachialis anticus and supinator longus, occasionally the supinator brevis and the infraspinatus and less frequently, the subscapulars.

Klumpke's palsy, or lower brachial plexus palsy, has been found less frequently. This results from a lesion of the eighth cervical and first dorsal roots and produces a paralysis of the muscles supplied by the ulnar nerve and the inner head of the median nerve.

Far less frequently have lesions of the secondary cords been encountered. Injury to the outer cord produces a paralysis of the muscles supplied by the musculocutaneous nerve and the outer head of the median. Injury of the posterior cord results in paralysis of the muscles supplied by the musculospiral and circumflex nerves, and injury to the inner cord

¹Read before the Chicago Neurological Society, January 22, 1926.

results in paralysis of the muscles supplied by the ulnar and inner head of the median nerve

There is a temptation and tendency to ignore that which does not fit in with a preconceived and accepted simple classification. Even in civil practice, it is common to find a lesion at first affecting the whole brachial plexus which later resolves itself into a more or less permanent injury to a part.

Gunshot injuries of the brachial plexus occurred in large numbers in the late war. The statistics vary considerably. Purves Stewart (8) found 61 such cases, 19 per cent, in 318 peripheral nerve injuries. Lehrman (3) found 37, 7.5 per cent, in 494 peripheral nerve injuries. Oppenheim (6) in a series of 1,612 cases found 84, 5 per cent. In my series of 1,020 cases, there were 79, 7.7 per cent.

Inasmuch as the lesions of the brachial plexus resulting from gunshot injuries have a tendency to recover spontaneously, there is considerable difference in incidence between the observations at the front and those in general hospitals where the material is seen some time after injury.

In military practice, injuries to the brachial plexus do not lend themselves so readily to a simple classification. Gunshot wounds produce injuries the extent of which is dependent upon the course of each particular missile and are so variable that there may be a lesion of roots, primary and secondary cords, all in a single case. Furthermore, the initial trauma, contusion, laceration, etc., is followed by changes secondary to hemorrhage, infection, fibrosis, and so on.

In addition to variable injuries, the numerous and wide variations in the formation of the brachial plexus as described by Borchardt (1) are responsible for atypical paralysis.

Anatomically the lesions may be grouped into supraclavicular and infraclavicular. It is striking that in 23 available and competent records of 44 cases seen in base hospitals in France, all were supraclavicular. This is in part explained by the fact that infraclavicular lesions, commonly injuries in the axilla, were complicated by injuries to bones and vessels which made the neurological aspect less urgent, and because of the necessary splints and dressings frequently led to misinterpreta-

tions, for example, a diagnosis of a combined ulnar and median nerve lesion instead of a lower brachial plexus lesion.

In a series of 35 cases observed in a general hospital a number of months after injury, there were 22 infraclavicular and 13 supraclavicular lesions. In the overseas cases there were only three lower plexus injuries, in those of the United States there were 12. Inasmuch as it has been found that lesions of the lower plexus are more frequently irrecoverable, the explanation is apparent.

Although it has been stated (Souttar and Twining, 7) that supraclavicular lesions produce injury of the roots and infraclavicular ones of the cords, this was not found to be true. Supraclavicular injuries apparently produce lower brachial lesions but rarely. An upper brachial plexus lesion is most commonly produced, but middle plexus lesions occur frequently. Infraclavicular injuries produce lower plexus paralysis most frequently, but middle plexus paralysis is likewise common.

The cases may be most readily grouped into upper, middle, and lower plexus paralyses. The upper plexus paralysis includes lesions of the fifth cervical nerve, the upper primary trunk (fifth and sixth cervical), and a combination of the upper primary trunk and a diffuse lesion of the middle plexus. The middle plexus lesions are produced by injury to the posterior branches alone (musculo-spiral and circumflex) or posterior secondary cord, or to the posterior and outer cord. In lower plexus paralysis there may be a lesion of the inner secondary cord alone or combined with a partial middle plexus lesion, or of the peripheral nerves, usually after complete formation of the median but at times before. Finally, we may have an incomplete paralysis of the whole brachial plexus.

The complexity of the symptomatology may be seen from this far from simple classification. This complexity is better illustrated by diagrammatic representations of brachial plexus lesions which frequently show the impossibility of correlating the motor loss to any single lesion and lead only to an approximation of a localization. Operative exploration verifies the conclusion that although the

greater part of an injury may be at one location, diffuse lesions occur elsewhere as well.

It has been found useful to employ diagrammatic representation of the location of an injury as described by Meigs (5). Two cases of upper brachial plexus lesions, due to injury of the fifth cervical nerve are illustrated in Figures 1 and 2. Figure 1 represents the location of a lesion in a soldier who had a paralysis of the deltoid muscle and a paresis of the spinati and triceps muscles. Figure 2 is a diagram of the lesion producing a paralysis of the deltoid muscle and a weakness of the spinati, pectoralis, latissimus dorsi, brachialis anticus, biceps and supinators.

Two other cases of upper brachial plexus lesions produced by an injury of the upper primary trunk are shown in Figures 3 and 4. In the case in Figure 3 there was a paralysis of the deltoid, spinati, biceps and brachialis anticus and a weakness in the subscapularis, supinators and the extensors of the wrist. In Figure 4 the lesion is not as clearly defined and there was found a paralysis in the deltoid and spinati and a weakness in the pectoralis, triceps, biceps, brachialis anticus, supinators and extensors of the wrists and fingers.

Two other cases of upper brachial plexus lesions of a more complicated nature are illustrated by Figure 5 which represents the location of a lesion producing a paralysis of the biceps, brachialis anticus, supinators and extensors of the wrists and fingers, and a weakness of the deltoid, spinati and triceps. Here we are dealing with an incomplete lesion of the upper primary cord and a more severe one of the middle plexus. Figure 6 represents a case in which the upper plexus was more severely injured and there resulted a paralysis of the deltoid, spinati, biceps, brachialis anticus, triceps, extensors of the wrist and fingers, supinators and pronators, flexor longus pollicis, and a weakness of the flexor carpi radialis and opponens pollicis.

Although for practical purposes the above cases could be divided into lesions of the cervical nerves, the upper primary cord and a combination of the upper primary cord and the middle plexus, it is apparent that none of the cases accurately corresponded to such a classification.

In contrast to the material of Oppenheim, few cases of relatively pure middle plexus lesions were seen. Usually there was found a severe lesion of the middle plexus combined with a partial lesion of the upper and lower plexuses, usually at the level of the secondary cords.

In Figure 7 is seen a middle plexus lesion produced by an injury to the posterior secondary cord. There was a paralysis of the deltoid, triceps, supinators, extensors of the wrist, fingers and thumb and in addition a weakness in the biceps, lumbricales, and opponens pollicis.

Figure 8 illustrates a combination of a posterior and outer secondary cord involvement. The deltoid, triceps, extensors of the wrist, fingers and thumb, the biceps, brachialis anticus, the supinators, pronators, the flexor carpi radialis, and flexor sublimis digitorum were paralyzed. The pectoralis and latissimus dorsi were weak.

Figure 9 represents a similar case. The deltoid, triceps, supinators, extensors of the wrist, fingers and thumb, biceps and brachialis anticus were paralyzed.

Figure 10 is an example of a partial lesion of the whole plexus, with a predominance of involvement of the middle plexus. The extensors of the wrist, finger, and thumb, the interossei and lumbricales, serratus magnus, deltoid, pectoralis, triceps, supinators, flexor carpi ulnaris, flexors sublimis and profundus digitorum, flexor brevis pollicis were paralyzed. The flexor longus pollicis, the thenar and hypothenar muscles were weak.

Figure 11, a similar case, had a paralysis of all of the muscles supplied by the musculospiral nerve, the flexor carpi radialis, palmaris longus, the hypothenar muscles, pronators and abductor pollicis, and weakness in the biceps, the brachialis anticus, flexor carpi ulnaris, flexors sublimis and profundus digitorum, interossei, lumbricales, flexor longus pollicis, and opponens pollicis.

Figure 12 is another somewhat similar case in which the supinators, extensors of the wrist, fingers and thumb, and all of the muscles supplied by the ulnar nerve and those of the median nerve, excepting the pronators and flexor carpi radialis, were paralyzed. The last

two muscles and the deltoid biceps and triceps were weak.

No case of isolated injury to the eighth cervical or first dorsal roots was observed, nor were any cases of pure inner cord injuries seen. Where the lower brachial plexus was injured, part of the middle plexus was included in the lesion. Axillary wounds produced a lesion commonly involving the ulnar and median nerves, at times, in addition, the musculospiral or the musculocutaneous, and rarely all of the peripheral nerves of the brachial plexus. The internal and lesser internal cutaneous nerves rarely escaped. At times the injury occurred before the complete formation of the median nerve.

In Figure 13 is illustrated an injury of the inner cord and middle plexus producing a paralysis of all of the muscles supplied by the ulnar nerve: the *opponens pollicis*, the short abductor of the thumb, the *flexor longus pollicis*, the *palmaris longus*, the *flexor sublimis digitorum*, and *flexor carpi radialis*, and weakness of the pronators, extensors of the wrist and of the thumb.

In Figure 14 there was a paralysis of all of the small hand muscles, the extensors of the fingers and thumb, the *flexors longus* and *brevis pollicis*, the *flexors* of the fingers, and a weakness in the triceps, extensors of the wrist, the pronators and *palmaris longus*. The sensory loss occurred in the distribution of the eighth cervical and first dorsal segments only.

The outer head of the median nerve rarely escaped some injury in these lesions, although usually complete paralysis did not result. Occasionally it was entirely spared, as in the following case (Fig. 15) in which a paralysis was seen in the small hand muscles, the *extensor longus pollicis*. Slight weakness was present in the *flexors* of the fingers and marked weakness in the extensors of the fingers and wrist. The pronators and *palmaris longus* were spared. There was complete analgesia over the ulnar but none over the median distribution.

Axillary wounds produced lesions corresponding in behavior to peripheral nerve injuries. The several nerves were injured in many combinations. Usually the ulnar and median, internal and lesser internal cutaneous

were injured together. At times the musculospiral and rarely the musculocutaneous were likewise involved.

Figure 16 illustrates a case with paralysis of all of the muscles supplied by the ulnar, median and musculospiral nerves. There was sensory loss over the internal and lesser internal cutaneous nerves.

Figure 17 illustrates a case in which the ulnar, median and musculocutaneous nerves were severed, and sensory loss was present over the internal and lesser internal cutaneous nerves.

Figure 18 illustrates a case in which the ulnar and median nerves were severed and sensory loss occurred over the distribution of the internal and lesser internal cutaneous nerves.

A few interesting observations may be made from the study of motor disturbances. Intravertebral root lesions occurred only when evidence of spinal cord injury existed. Paralysis of the *latissimus dorsi* and pectorals occurred more frequently when the primary cords were injured. The supinators frequently escaped in a lesion corresponding to the fifth cervical root. Lesions of completely formed nerves and of roots produced complete paralysis, whereas other lesions produced incomplete paralysis. In middle plexus lesions when the median nerve was slightly injured the *opponens pollicis* seemed to be the most vulnerable muscle.

SENSATION

The sensory loss is rarely coextensive with the motor disability. It is not as reliable an index to the extent or severity of the injury as is motor loss.

Soon after injury the sensory loss is quite extensive but it rapidly shrinks so that some months later the motor loss may be complete for a certain localization whereas little sensory loss may be found. At times complete sensory loss may be found and the motor disability be slight. This is particularly true of lesions of the inner cord. In the latter case, as has been found in ulnar nerve lesions, the sensory loss is often complete when but slight motor disability exists. Sensory loss coextensive with motor paralysis was usually seen in lesions of

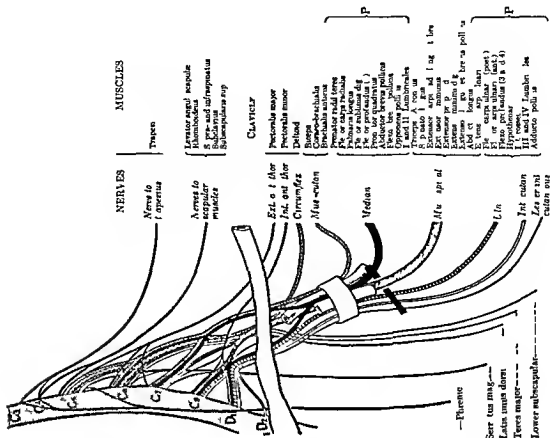


Fig. 18

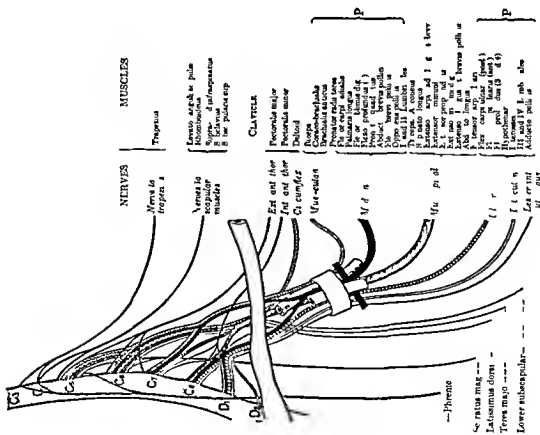


Fig. 17

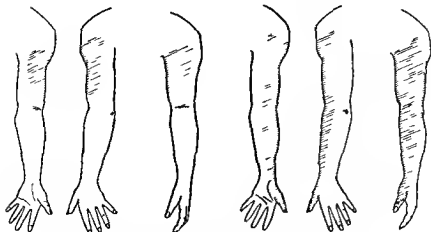


Fig 19

Fig 20

Fig 19 (left) Sensory loss in lesion of fifth cervical root

Fig 20 Sensory loss in lesion of fifth and sixth cervical roots

the roots as fifth cervical or fifth and sixth cervical (Figs 19 and 20)

The same condition was met with when the injury affected the fully formed peripheral nerves (Figs 21, 22 and 23)

Attention should be called to the fact that with the exception of root lesions and primary cord lesions the sensory loss consequent to injuries of the brachial plexus corresponded neither to a root nor a peripheral distribution.

In upper plexus lesions usually root or primary cord the sensory loss corresponded closely to a root distribution. At times even when the biceps was not paralyzed there was an analgesia over part of the sixth cervical segment. In a lesion producing a paralysis of the deltoid, biceps and supinator longus

muscles the sensory loss never extended to that part of the hand usually attributed to the sixth cervical segment. On the other hand when in addition to the biceps the pronator radii teres was paralyzed sensory loss was found over the radial side of the palm including the index finger and thumb (Fig 24). That this represented the sensory supply of the outer head of the median nerve is further supported by such cases as show, among other things, a paralysis of the muscles supplied by the median nerve with the exception of the pronator radii teres alone or along with the flexor carpi radialis. Here sensation is unaffected over the radial part of the palm.

In Figures 25 and 26 the former a lesion of the inner primary cord and the latter a lesion of the posterior and inner cords the radial side of the palm was sensitive as well as the palmar surface of the thumb. It may be concluded therefore that the sensory area of the outer secondary cord of the brachial plexus is represented by the sensory distribution of the musculocutaneous nerve and that part of the median supplying the radial surface of the palm, the thumb and part of the index finger. This part of the median sensory supply would then correspond to the anterior division of the seventh cervical root (Fig 27).

The inner cord is represented by the sensory supply of the internal cutaneous lesser internal cutaneous ulnar and the median, with

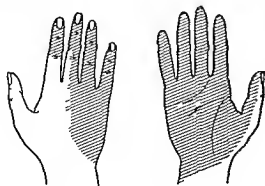


Fig 21 Sensory loss in ulnar and median nerve lesion

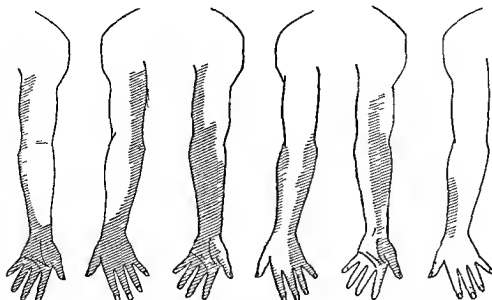


Fig 22

Fig 23

Fig 24

Fig 22 Sensory loss in lesion of ulnar median musculospiral, and internal and lesser internal cutaneous nerves

Fig 23 Sensory loss in lesion of ulnar median musculocutaneous internal and lesser internal cutaneous nerves

Fig 24 Analgesia of thumb and index finger when pronator radialis is paralyzed

the exception of the thumb, part of the index finger and radial side of the palm

COMBINED BRACHIAL PLEXUS AND SPINAL CORD LESIONS

Brown-Sequard paralyzes frequently occur red as the result of gunshot injuries. It is to be expected that injury to the roots may occur on the side of the injury to the spinal cord. At times, however, there have been observed cases in which the symptoms, sensory

and motor alike, corresponded neither to a root lesion, an intramedullary or a peripheral nerve lesion (Gordon Holmes, 2). Such cases undoubtedly belong to the group described by Mane and Benisty (4). Immediately following a gunshot wound in the neck the injured man falls paralyzed in all extremities, within a few days function is recovered in one arm and leg, leaving a spastic paralysis of the lower extremity on the side of the injury and a flaccid paralysis in the upper extremity, with a loss

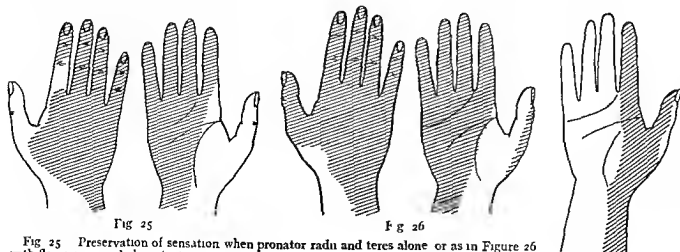


Fig 25

Fig 26

Fig 25 Preservation of sensation when pronator radialis and teres alone or as in Figure 26 with flexor carpi radialis intact

Fig 27 Sensory representation of outer head of median

Fig 27

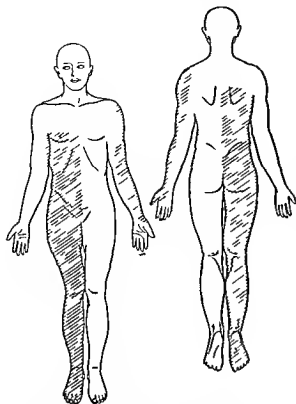


Fig 28 Sensory loss in Brown Séquard lesion of the spinal cord with ipsilateral brachial plexus injury

of sensation to pain temperature sense on the opposite side of the body below the level of the lesion. The paralysis in the leg spontaneous and often rapidly disappears leaving a long lasting flaccid paralysis in the upper extremity which is due to a lesion of the brachial plexus. Often the wound of entrance is about the face mouth or jaws and at times there occurred a paralysis of the seventh or twelfth cranial nerves. A paralysis of the cervical sympathetic was common.

I found only 10 records of such cases although I remember seeing a number of others. They exhibited a symptomatology and course peculiarly similar and a description of one will suffice.

V E N Pvt 26th Infantry was wounded July 18 1918. A gunshot wound had been received at the angle of the inferior maxilla with exit of bullet over the second cervical spinous process. He felt the missile strike him and was thrown into the air falling having at first tonic then a few clonic jerks in his extremities which were then paralyzed. He began to use his right leg 2 days later then his right

arm and shortly after regained some power in his left leg. When admitted to U S B H No 13 on September 19 1918 he was able to perform all movements with the right lower extremity with good power. There was moderate weakness in the muscles of the left lower extremity the flexors of the legs being the weakest muscles. All of the muscles of the right upper extremity were very weak. There was a paralysis of all of the muscles of the left upper extremity with the exception of the deltoid biceps brachialis anticus latissimus dorsi pectoralis levator anguli scapulae and serratus magnus which were very weak. The deep reflexes in the lower extremities were increased and were greater on the left side. In the upper extremities they were absent with the exception of the biceps which was brisk on the left and normal on the right. The superficial reflexes were absent on the left side and a Babinski was present. There was a Horner's syndrome on the left side. There was a hyperaesthesia of the left side of the body below the second dorsal segment. There was an analgesia and a loss of temperature sense on the right side distal to the sixth cervical segment and loss of sensation over the fifth sixth seventh and eighth cervical segments on the left.

Particularly interesting are such cases in which the upper level of the contralateral analgesia is a number of segments below the residual sensory loss on the side of the lesion (Fig 28).

It has been assumed from a study of Brown Séquard paralysis that the fibers for pain and temperature senses require a number of segments for complete crossing in the cervical cord. The observation that these fibers cross more directly in the dorsal region points out the possibility that the sensory loss resulting from a brachial plexus lesion may be misinterpreted as that due to a cord lesion. It is possible that the absence of a thoracic plexus has led to a more accurate interpretation of the crossing of protopathic fibers in this locality.

BIBLIOGRAPHY

1. BORDHARDT M. Beitr z klin Chir 1916 61 82
2. HOLMES GORDON Brit M J 1915 Dec 855
3. LEHRMAN W. Chirurgie der peripheren Nervenverletzungen. Berlin Urban und Schwarzenberg 1921
4. MARIE PIERRE and BENISTY A. Soc méd des hôp de Paris 3d Series 1915 LXXIX 421
5. MEIGS H. Nerve Lesions. A Benisty Military Medical Manuals. Univ of London Press 1918
6. OPPENHEIM H. Lehrbuch der Nerven Krankheiten. Berlin S Karger 1923
7. SOUVRAY and TWINING. Injuries of the Peripheral Nerves. New York William Wood & Co. 1920
8. STEWART and EVANS. Nerve Injuries and Their Treatment. London Oxford Medical Publications 1916

CALCULI OF THE SALIVARY GLANDS AND DUCTS

By GUY R. HARRISON, D.D.S., RICHMOND, VIRGINIA
McGuire Clinic

CALCULI of the salivary glands and ducts are of interest because of their infrequency, because of the difficulty and the importance of making a diagnosis of their presence, and, finally, because of the gratifying results that invariably follow their timely and proper removal.

OCCURRENCE

Nearly all writers on the subject of salivary concretions with the exception of Garretson the father of oral surgery, regard their presence as unusual. In Garretson's opinion "The existence of salivary concretions in the ducts, particularly the whartonian, is not at all infrequent, indeed, they are occasionally to be met with in the substance of the glands themselves." A careful search of all available literature from 1825 to the present time results in the finding of only 375 cases. If salivary stones are as common as Garretson would have us believe, it is singular that so few cases have become a matter of record.

These calculi occur more frequently in males than females and they appear at all ages, apparently they are found as often in the young as in the old. Burdel (3) reports a case of a stone in the sublingual duct in an infant 3 weeks of age. This stone must have been present or in the making at birth.

Salivary stones vary in size from that of a pin point (Fig 1) to one removed by Garretson that measured one and one eighth inches in length and two inches in circumference. The calculi formed within the substance of a gland are invariably larger and more irregular than those found in the ducts (Fig 2). It has been observed that the majority of the stones that give clinical signs are small.

Salivary concretions are usually single, yet multiple stones have been reported especially in connection with the parotid gland (Fig 3). Noehren (6) cited a case in which fourteen stones were removed from the parotid duct at one operation. Equally interesting is a

statement by Hanszel (5) that in "only one case have calculi been found in more than one gland or duct in the same person." Garretson refers to a case "in which the glands of either side were found stuffed with calculi."

LOCATION

In about two thirds of the reported cases, stones were found in the submaxillary gland or duct, about 20 per cent were found in the

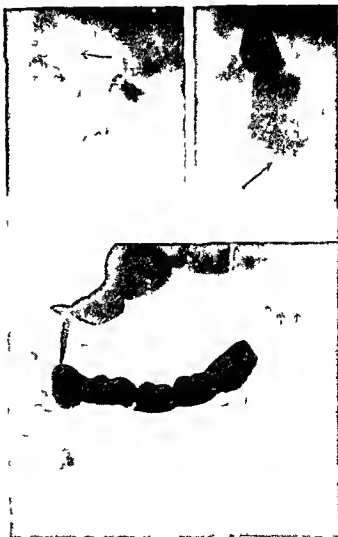


Fig 1 (left above) Small calculus in parotid duct
Fig 2 (right above) Calculus in submaxillary gland
Larger than most salivary calculi and very irregular in form
Fig 3 Three calculi in masseteric portion of parotid duct



Fig 4 Excised submaxillary gland which has been incised and probe placed in duct. Arrow points to a small calculus. In such cases the calculus acts as a ball valve. Roentgen ray findings were negative.

parotid gland or duct and a much smaller number in the sublingual gland or duct.

COMPOSITION

Chemical analyses have been made frequently. The following by Prouzerque (8) while high in calcium phosphate may be taken as an example. Calcium phosphate about 60 to 65 per cent organic matter about 25 per cent calcium carbonate about 6 per cent traces of iron magnesium etc. Theories as to salivary stone formation will not be discussed in this paper but it may be said in passing that the available data confirms the dictum of Prinz (7) that all concretions formed in the animal body are dependent upon an inanimate nucleus as a starting point.

SYMPTOMS AND DIAGNOSIS

Symptomatically patients affected with salivary stone may be divided into three groups.

Group 1. Patients who upon eating foods, particularly those with an acid reaction, experience pain and swelling in the region of the involved gland or duct. In this group the stone is usually small and acts as a ball valve (Fig 4).

Group 2. Patients who may or may not present a history of recurrent swelling but who suddenly experience pain and swelling in the region of a salivary gland with an elevation of temperature. In these cases a chronic inflammatory condition is present in the involved gland (Fig 5).

Group 3. Patients who present a board-like swelling which fixes the tissues over the involved gland or duct. If the submaxillary or sublingual gland is involved the swelling



Fig 5 Calculus in submaxillary gland above mylohyoid muscle. Illustrates the need for more than one roentgenogram made in different position. From roentgenogram made in usual position. Area to which arrow is pointing might be an area of increased calcification within mandible. It shows rays situated not in mandible but in soft tissue between mandible and the midline of body. Also see Fig 9.

also fixes the floor of the mouth. Often there is present the much dreaded cellulitis of the neck, which may be followed by suppuration.

The earliest and most classical symptom in the majority of cases is the so-called salivary colic of the French, which is produced by the retention of saliva and is accompanied with varying amount of pain and discomfort. This condition is brought on by taking food particularly such as stimulates the secretion of saliva or it can be brought on by the administration of sialogogues.

Salivary stones without infection may exist for years with no attending symptoms. Patients may be conscious of the presence of a hard mass. There may be marked dysphagia and dysphonia especially in the acute suppurative cases. When the submaxillary gland is involved there is often severe pain in the tongue. In many cases the only symptom is the presence of pus at the duct orifice. Patients often seek relief for infections believed to be due to the teeth and at times it is very difficult to differentiate infections of dental origin from a suspected stone. Stenosis from any cause and foreign bodies other than stones will give many of the clinical signs of stones.

Probing a suspected duct is advised by many but experience leads the writer to doubt its value and it may do harm by producing a perforation. When a positive diag-

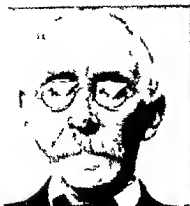


Fig 6



Fig 7



Fig 8

Fig 6 Enlargement of the parotid gland due to syphilis
Fig 7 Branchial cyst May be mistaken for cystic growth of submaxillary gland
Fig 8 Chronic low grade infection of parotid gland

which rarely ever suppurates. Often seen in children and may give symptoms simulating the presence of a calculus. In these cases roentgen ray treatment has given the best results.

nosis can be made by probing the duct the stone can nearly always be palpated intra orally or by a combined intra and extra oral palpation. It seems that far more valuable information may be obtained by the method suggested by Blair (1) of puncturing with a strong hypodermic needle attached to a syringe with which the tissues are infiltrated with an anesthetic solution as the needle is slowly passed through them.

Brown (2) reports a case of obstruction of the parotid duct orifice due to scar tissue produced in a patient who had a habit of biting the cheek. This illustrates the fact that a definite history of an injury preceding an attack of salivary colic can be obtained in some cases. Acute cases may easily be incorrectly diagnosed as lymphadenitis. In patients who have had many acute attacks especially with suppuration malignancy is often suspected. In addition to the other conditions that should be considered a differential diagnosis must be made between enlargements of the salivary glands due to syphilis (Fig 3) tumors congenital cysts (Fig 7) actinomycosis all inflammatory lesions (Fig 8) epidemic and postoperative parotitis areas of increased calcification in the mandible (Fig 9) and pseudohypertrophy or Mikulicz's disease.

THE ROENTGEN RAY

Naturally the roentgen ray is thought of immediately as a diagnostic aid but in a certain percentage of cases salivary stones cannot be demonstrated by this means of examination. Positive information can be obtained by the use of the roentgen ray in about 75 to 80 per cent of the cases and then only by careful and repeated examinations. This is not due to the fact that these stones are not radiopaque but rather to their being unusually small. Furthermore, the anatomy of the parts involved is such that it is with difficulty the shadows of the superimposed structures can be thrown off the area of the stone. Again the amount of tissue which the rays have to penetrate to reach the plate is so great that if sufficient penetration is given to get through the shadow of the stone is frequently obliterated.

TREATMENT

The treatment is obvious namely removal of the stone. If situated in the sublingual duct or gland the anterior two thirds of the submaxillary duct or the buccal portion of the parotid duct they can be extracted without external deformity by an intra oral incision. If they are located in the masseteric portion of the parotid duct, the parotid gland, the



Fig. 9



Fig. 10



Fig. 11

Fig. 9. Illustrates method of determining location of areas of increased calcification about the mandible. In A mass appears to be mandible. B shows this to be the case.

Fig. 10. Three calculi located in deep portion of parotid gland. On account of their location and the slight symptoms patient having operation was not advised. This case is not included in the 27 reported in this paper.

Fig. 11. Calculus in sublingual gland.

posterior third of the submaxillary duct or the submaxillary gland an external incision is desirable. If stones are situated in either the sublingual or submaxillary gland extirpation of the gland is indicated. In order to lessen the possibility of a salivary fistula gland removal is advisable in some cases of salivary stones located in the ducts and especially when an inflammation of the ducts and glands is present.

One case of the series reported in this paper had a submaxillary fistula following an abscess due to the presence of a stone. This is of interest because Roberg (9) in an excellent article states that he found no record of a salivary fistula due to stone other than of the parotid gland or duct.

After removing the submaxillary or the sublingual gland the wound should be closed and the line of the incision kept moist for 48 hours or more. This procedure avoids the use of drains and as a result one is able to secure a neater scar.

When the stone is located in a duct fixation of the stone with hypodermic needles before cutting down on it aids greatly in the removal. Many stones are rough and bound down with tissue strands which add to the difficulty of the operation. In such cases careful and painstaking dissection should be employed. No effort should be made to grasp a stone and forcibly extract it, since it will most surely

TABLE I — STATISTICS IN 27 CASES IN WHICH OPERATION WAS PERFORMED

Glands involved	Sex	Roentgen findings
Parotid gland 3 cases	Men 6	Positive in 8 cases 80 per cent
Parotid duct 7 cases	Women 4	
Right side 5		
Left side 5		
Total 10		
Submaxillary gland 5 cases	Men 11	Positive in 13 cases. 86.6 per cent
Submaxillary duct 10 cases	Women 4	
Right side 11		
Left side 4		
Total 15		
Sublingual gland 1 case	Men	Positive in both cases 100 per cent
Sublingual duct 1 case		
Left side 2		
Total 2		

Total cases 27. Positive roentgen ray findings in 22 equal 81.4 per cent.

be crushed, thus increasing the difficulty of removal. A good method is to pass a spoon curette beneath the stone and dissect upon it.

It is considered best not to operate upon an acutely infected case unless suppuration is present, but instead to put the patient on a liquid diet without fruit juices, to apply ice packs locally and to give repeated small doses of atropine. If suppuration is present and sepsis threatens drainage of the cervical tissue planes and lymph spaces is indicated.



Fig 12

Fig 13

Fig 14

- Fig 12 Calculus in parotid gland Note cyst in body of mandible
 Fig 13 Calculus in parotid gland To demonstrate this calculus it was necessary to make a large number of roentgenograms
 Fig 14 Calculus located in submaxillary gland beneath mylohyoid muscle

DANGER TO NERVE SUPPLY

Incisions made over the submaxillary duct intra orally may sever the lingual nerve, those made into the parotid gland or duct externally may injure the seventh nerve. If in approaching the submaxillary gland externally the incision is made too high or too far forward, it may cut the branch of the seventh nerve supplying the depressor muscles of the angle of the mouth. Because of the possibility of injuring the motor nerves all incisions should be located with great care. Carter (4) reports an interesting condition after operation upon one submaxillary gland in which there followed a sympathetic involvement of all other salivary glands except the parotids.

It is advisable to remove stones regardless of whether they are producing symptoms, since they are always a source of potential danger.

CONCLUSIONS

1 Salivary calculi though uncommon, are not rare and are always of clinical significance. A series of 27 cases is here reported.

2 The condition occurs at all ages, and may affect any of the glands, the submaxillary is

most often involved. The stones are usually single but may be multiple.

3 The symptoms are local and due to obstruction to salivary outflow. If secondary infection occurs there is an accentuation of local symptoms together with certain constitutional manifestations which at times may become quite serious.

4 A presumptive diagnosis is fairly easily reached but requires certain important differentiations. A specific localization of the calculus is often very difficult, but at times necessary and is dependent largely upon a carefully developed X ray technique.

5 Treatment is surgical.

REFERENCES

- 1 BLAIR. Surgery and Diseases of the Mouth and Jaws. Mosby Co.
- 2 BROWN. Oral Diseases and Malformations. Lea and Febiger.
- 3 BURDEL. Comp rend Acad d sc Paris 1860 1 893.
- 4 CARTER. Laryngoscope 1917, xxvii 881.
- 5 HANZEL. Wien Klin Wchnschr 1900 p 160.
- 6 NOERREN. J Am M Ass 1923 lxxx 25.
- 7 PRINZ. Dental Cosmos 1921 lxiii 508.
- 8 PROUZERQUE. Arch de méd et pharm mil 1911 lviii 25.
- 9 ROBERG. Ann Surg 1904 xxxix 669.

URIC ACID AND URATIC STONES IN THE KIDNEY—URIC ACID SHOWERS AND THEIR DIAGNOSIS¹

By EDWIN BEER, M.D., F.A.C.S., New York

From the Surgical Service of the Mt. Sinai Hospital

ONE of the most serious pitfalls in making a diagnosis encountered by the surgeon, internist, or radiologist is the failure to recognize uric acid stones and to interpret correctly the clinical picture associated with such stones or with showers of uric acid crystals. This problem has interested us for many years and in repeated publications and discussions references have been made by me and by members of my staff to the difficulties of diagnosis and to the hope that by more elaborate study in each case these conditions may be recognized. When the problem first presented itself we were chiefly interested in the diagnosis of stones in the urinary bladder and we called attention to the fact that the cystoscopic examination was of infinitely more value in recognizing these stones than were roentgenograms taken with the old fashioned X-ray apparatus prior to the introduction of the Bucky screen. At that time I called attention² to the frequent presence of ammonium urate stones in the bladder especially in prostatics with clear urine and to the regularity with which the older X-ray machines missed these stones which were regularly seen with the cystoscope. In a further study of this problem one of my staff found that of 57 cases of vesical calculi 61 per cent of the X-ray pictures were negative for stone and in these cases the chemical analysis of the stones showed ammonium urate.

When the problem is transferred to the upper urinary tract where uric acid stones and uratic stones occur with some frequency the recognition of these stones becomes a most important study for the surgeon and the recognition of uric acid showers producing all the symptoms of a stone becomes equally important. The failure to recognize the presence of such conditions undoubtedly may have led to many erroneous interpretations in the past

among which might be mentioned only such diagnosis as colics due to angulations or kinks in the ureter to strictures of the ureter and the like.

Prior to the introduction of the Bucky screen it was almost impossible to get a picture of these stones on the X-ray plate or film but with the marked improvement as a result of the introduction of this remarkable aid many stones, if they are sufficiently large even though composed almost exclusively of uric acid or urates will throw a faint shadow and in the urinary bladder with the Bucky diaphragm we now get almost regularly faint stone shadows when this type of stone is present. When, however, the stones are situated higher up in the ureter and kidney where they often are much smaller even this improved technique fails to demonstrate the presence of the offending foreign body. In the few years that preceded the introduction of the Bucky screen many of us tried to render such translucent stones opaque to the X-ray by coating them or attempting to coat them with opaque materials such as argyrol and the like.³ Some men particularly in Germany for example Kuemmel thought that in this way they could regularly make a translucent stone appear as an opaque one. In a more or less recent edition of a large surgical compendium published in Germany Kuemmel makes the rather broad statement that all stones can be shown by the X-ray and that statement was made before he could have had the benefit of the Bucky diaphragm. J. Israel 1925 reports that he almost always gets positive shadows in his X-ray studies and that more mistakes are occasioned by the finding of extrarenal shadows than by failure to get positive shadows.

In our hands these methods of making non opaque stones opaque by coating them

¹W. A. and listed to D. S. Bookman, 1st at Mt. Sinai Hospital Chemical Laboratory for Urinary Analyses.

²J. Am. M. A. 1913 Oct. 12.

³Read before the Gen. U. ry Section New York Academy of Medicine March 1916.



Fig 1 Case 2 I L Routine X ray negative Pyelogram showing large filling defect caused by one large $1\frac{1}{2}$ by 2 centimeter stone and numerous small stones of uric acid

have almost always failed, so that it has been necessary to seek other means of making possible the recognition of these stones. One need only study the chemical analyses of a large series of these stones to realize the importance of the condition.¹ In looking over H. Morris' *Surgery of the Kidney*, I find that in an analysis of 77 stones he states that 22 per cent showed uric acid composition. Several years ago I published an analysis of a series of stones in which I found that the number of uratic and uric acid stones in the upper urinary tract was approximately 11 per cent. Recently I have had Dr L. Mann make a study of the kidney stones which have been removed in our clinic during the past 4 years. He reports that of a total of 136 cases about 10 per cent showed almost pure uric acid with or without urates frequently associated with traces of magnesium phosphate, calcium phosphate, calcium oxalate, calcium carbonate or calcium and magnesium phosphate.

It is evident therefore that the problem is a very serious one and that if we rely upon the negative X ray findings—the amount



Fig 2 Case 3 A W Routine X ray negative Pyelogram showing filling defect due to uric acid stone

of phosphates, carbonates, etc., in these stones is usually so small that it does not suffice to throw a shadow—we are running the risk of making an error in diagnosis in approximately 20 per cent of the patients with kidney stone who come to us for relief. In England, apparently, the incidence is much higher, which is probably due to the dietary differences that exist between the two peoples.

I desire to call attention in this paper to a series of cases which has come to operation and in which the diagnosis has been proved but before doing so I would refer to 4 cases of a similar character reported by my colleague Dr A. Hyman in the *International Journal of Surgery*, March 1919. In this paper Hyman reported 4 cases in which the X ray findings were negative and in which the stones were composed chiefly of ammonium urate and were recovered either by operation or removed at autopsy. In the present series most of them very recent cases I report six more cases of uric acid calculus in the kidney in which the

¹For several years I tried to coat these stones by producing an artificial phosphaturia which I hoped would make an opaque mantle but up to date I have failed though the artificial phosphaturia was read by p o duced

diagnosis was made by a combination of all the usual methods of examination in addition to the demonstration of a filling defect in the pyelogram of the diseased kidney, and usually confirmed by obtaining a positive scratch mark on a wax whale bone bougie passed into the offending organ.

CASE 1. Mrs. U. female, age 55 years, had had several attacks of renal colic on the right side. During these attacks on two occasions she passed stones. Prior to coming to me she was subjected to X-ray examination and the diagnosis of possible stone in the lower right ureter was made. The kidneys showed no stones. The patient at the time complained of pain low down in the right iliac fossa and of hæmaturia whenever she walked in the streets. She was referred to me for oil injection of the right ureter to assist the passage of this suspected stone. On several occasions the ureter was dilated and oil was injected but no stone passed. Some time after the third oil injection the patient passed a number of small stones without any colic but despite the passage of the stones which chemically showed uric acid and urates the patient continued to bleed rather profusely whenever she walked in the streets. Whenever the patient was cystoscoped no bleeding was detectable even though the bladder continued at the beginning of the examination wine colored urine. With a catheter in the right pelvis after obtaining a flow of clear urine manipulation of the catheter induced bleeding which suggested together with the history of right sided colics that the patient had a lesion in the right pelvis. On one occasion a wax bougie was passed into this pelvis and a definite scratch was made on the bougie. In the lower ureter on the right side there was no positive scratch mark and roentgenograms with catheters in position showed that the shadow in the lower pelvic ureter was extra-ureteral. A pyelogram of the right kidney pelvis showed a filling defect or a thinning of the bromide shadow. From all these data the conclusion was forced upon us that the patient had a uric acid non opaque stone in the right pelvis and that the stone was causing the colics and the hæmaturia. Before operating upon her on another occasion four wax bougies were passed into the right pelvis one directly after the other and much to our surprise no scratch mark was obtained. Nevertheless in view of the positive scratch marks obtained on one occasion the induction of active bleeding in the right kidney by ureteral catheter manipulation the apparent filling defect in the pyelogram the history of bleeding on exercise and the fact that the patient had previously passed calculi of uric acid composition operation was advised with a diagnosis of uric acid stone in the right kidney pelvis. After removing the stone by pyelotomy because of the technical difficulties I was compelled to do a nephrectomy and on opening the pelvis I found

that there was an ulcer in the lower part of the pelvis against which the flat uric acid stone¹ was rubbing with two sharp points whenever the patient was in the vertical position. The stone is about the size of a nickel and is rather flat. The kidney in addition showed extensive uric acid infections in the papillæ such as one sees in the kidneys of newborn children.

CASE 2. Mr. L. age 45. His chief complaints were abdominal pains which had been present for 3 to 4 weeks. He had however had hæmaturia 8 years before. The attacks of hæmaturia had been repeated without definite urinary symptoms. Several months prior to admission he had had severe right lumbar pain which radiated to the scrotum but was not associated with urinary symptoms. Three to four weeks prior to admission he developed urgency and passed bloody urine for several days. Physical examination was negative. The urine contained a trace of albumin, red blood cells and his blood chemistry was normal, the uric acid being only 3.5. The phthalein output was 28 per cent in 2 hours. The cystoscopic examination showed a slight cystitis. There was good indigocarmine excretion from the left kidney but none from the right. There was no obstruction to the passing of the catheter and no evidence of retention in the pelvis. Both kidney specimens contained a few white blood cells and many red blood cells. The urea on the left side was 1.2 per cent and on the right side 0.6 per cent. By manipulation of the catheter it was impossible to induce bleeding in the right pelvis which was the side in which we suspected the presence of stone.

Prior to the above cystoscopic examination a complete genito-urinary X-ray picture had been taken and no evidence of a calculus could be discovered. Subsequent to cystoscopy a pyelogram was made of the right kidney and the kidney pelvis was found to be enlarged. There was no evidence of a calculus before the filling but after filling the pelvis we found a large defect occupying the pelvis (Fig. 1) caused by a large stone. The pre-operative diagnosis therefore was either uric acid stone or stones in the right kidney pelvis or possibly a papillary tumor of the pelvis causing a filling defect. By pyelolithotomy the large stone was removed from the pelvis and during the manipulations distinct crepitation was felt. This was due to the fact that in addition to the large stone there were several small stones within the pelvis. The large stone was brown in color and the smaller stones were slightly lighter in color. During the operation one of the small stones slipped into the dilated ureter and was recognized by probing the ureter. It was milked back into the pelvis and removed. In all this patient had five stones in his kidney none of which could be seen by the X-ray even with the Bucky diaphragm. The chemical analysis of these stones showed uric acid.

CASE 3. Mrs. W. age 32. Twelve years prior to our seeing her she had had an appendicectomy.

Chemical: Urine: sh. w. uric acid 1.

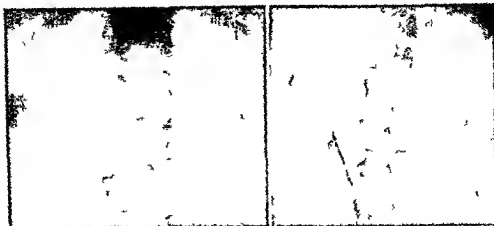


Fig 3 (1 ft) Case 4 S R Routine X ray shows faintest shadow which has been outlined to make it clearer 3 centimeters by $1\frac{1}{2}$ centimeters shaped like an arrowhead behind and under the twelfth rib on left side

Fig 4 Case 4 S R Pyelogram showing almost empty pelvis due to large stone of uric acid which makes the large defect

About 6 months before entering the hospital she had severe pain in the right flank which did not radiate and she had burning over the bladder associated with hæmaturia and frequency. The attack lasted 1 week. The physical examination again was negative as far as the genito urinary tract was concerned. X ray taken prior to cystoscopy showed no calculi in the genito urinary tract. The cystoscopy of the bladder showed mild trigonitis no obstruction and no retention in the pelvis. The right kidney secreted clear urine but the indigocarmine concentration on the right side was slightly less than on the left. The urea output on the right side was 0.6 and on the left side 0.4. There was no evidence of infection in either kidney. The phthalein output was 35 per cent in 2 hours and the blood chemistry was normal. No tubercle bacilli were found in the urine and no scratch mark was made on the wax bougie passed into the right kidney. As no diagnosis had been reached the patient was discharged and advised to return during an attack of hæmaturia. When she was re-admitted she was re-examined completely and on two occasions in the right kidney a scratch mark was made in the bougie. A pyelogram taken at this time showed a filling defect (Fig 1) in the kidney pelvis and with the diagnosis of a uric acid stone in the pelvis of the right kidney a pyelolithotomy was done and the stone removed. The chemical analysis of this stone showed almost pure uric acid with small amounts of calcium and magnesium and ammonium phosphate.

CASE 4 Mrs R 34 years of age. Complained of pain in the left lumbar region and left flank. Two years prior to admission she had had left renal colic radiating to the genitalia associated with nausea and vomiting. She had had hæmaturia for 2 or 3 days. The colic recurred about six times without bleeding. However she developed frequency and urgency and occasionally dysuria. For the

last six months she has had aching pain in her right flank. On physical examination the patient was found to have no costovertebral tenderness. The phthalein output was 45 per cent. The blood pressure was 120-80. She had had an X ray examination outside (Fig 3) and the faintest shadow was seen in the region of the left kidney pelvis. Control X rays at Mt Sinai Hospital showed a similar faint shadow less distinctly and only on one of the films. Cystoscopy showed a normal bladder with slight oedema and redness about the left ureteral orifice. The indigocarmine output on the right side was good none on the left side. The urea was 2.5 per cent on the right side and 0.4 per cent on the left. No uric acid crystals were found in the urine. Both specimens were sterile and the patient's blood chemistry was normal the uric acid being only 2.5. A left pyelogram was taken which showed a distinct filling defect in the left kidney pelvis with dilation of the calyces. A wax bougie was passed and was definitely positive. A large stone was removed from this patient's left kidney by pyelolithotomy and the chemical analysis of this stone showed uric acid with traces of ammonium urate and calcium urate (Figs 3 and 4).

CASE 5 Mr F 40 years of age had no complaints but was told by a life insurance examiner that he had blood in his urine. According to his history in recent months he had at times passed brown colored urine. He had no pain on either side but on X ray examination a small shadow was seen in the left lumbar region which might very well have been a kidney stone. He was again subjected to X ray examination at Mt Sinai Hospital and this same shadow which had been picked up outside of the hospital in an X ray picture was seen in our pictures and corresponded to the lower calyx of the left kidney. Cystoscopic examination showed good indigocarmine excretion on both sides. There was no obstruction in the

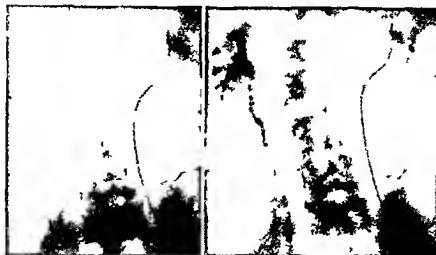


Fig. 5 (left) Case 5 J. F. X ray catheters in both ureters. Small stone shadow in pelvis of left kidney with faint extension into lowest calyx.

Fig. 6 Case J. F. Same case with pyelogram of left kidney showing extensive irregular defect in lowest calyx caused by several uric acid stones, one of which had a coating containing calcium.

ureters and no retention in the pelvis. On manipulating the catheter in the left pelvis some bleeding was induced. The urine from both sides was clear except for the blue dye and the urea concentration was slightly stronger in the left specimen than in the right. Both specimens contained no pus and were sterile. A wax bougie was passed up the left ureter and a questionable scratch mark obtained. A pyelogram was made (Figs. 5 and 6) and a very extensive filling defect was found in the lower calyx and pelvis of the left kidney. The size of the filling defect was out of all proportion to the size of the putative stone shadow seen in the previous pictures, and the question arose as to whether the patient had a uric acid stone in his left kidney or a partially calcified pelvic papillary growth. A nephrotomy was done and the stones easily located in the anterior convexity of the lower pole. Three good sized stones were removed through the incision. The largest stone was about 1.25 inches by 1 inch in diameter and looked like an enormous tooth with root like prolongations. The other two stones which lay deeper in the calyx were about the size of a garden pea. The chemical analysis of these stones showed almost pure uric acid and in the mantle small amounts of calcium (Figs. 5 and 6).

CASE 6 Mr. N. age 62 years entered the hospital complaining of cramplike pains in the umbilical region radiating to the right side and occasionally to the right lumbar region. The pain first appeared three years ago and came on in attacks which lasted 10 or more hours. These attacks occurred first a few times a month more recently two or three times a day. During the last 3 months he has noticed blood in the urine after the attacks and he has had frequency of urination. He had been

operated upon previously for appendicitis and for gall bladder trouble but the operating surgeon apparently had found no gall stones. It is very possible in view of the subsequent events that both these operations were superfluous. On physical examination nothing abnormal was detected. His urine contained a few pus cells, some red cells, a trace of albumin. The phthalein output was 6 per cent in 4 hours. His blood chemistry was normal, uric acid being only 2.5. His blood pressure was 100-80. X ray examination of the genito-urinary tract showed nothing abnormal. There was no obstruction in either ureter. The indigo output on both sides was fair. The capacity of the right pelvis was 15 cubic centimeters. The urea output on both sides was equal and no pus was present in either specimen. A pyelogram was made of the right kidney and a defect of 1 centimeter by 2 centimeters was seen in the pelvis of this kidney (Fig. 7). As there was some doubt as to whether this might be an air bubble, a second pyelogram was taken a few days later which showed a shadow of the same shape as previously demonstrated but now in the lower calyx of the right kidney. On two occasions a wax tip bougie was passed into the right kidney and each time a scratch mark was obtained. With a diagnosis of a uric acid stone in the right kidney a pyelolithotomy was done and a stone oval in shape about 1 centimeter by 2 centimeters was removed without any difficulty. The chemical analysis of this stone showed uric acid with traces of calcium phosphate (Figs. 7 and 8).

From these studies it will be seen that real sizable stones of the composition that fails to show a shadow in the X ray film are not at all

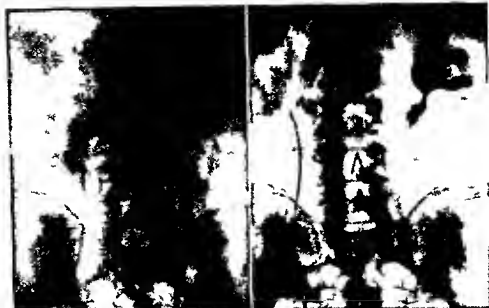


Fig 7 (left) Case 6 J N Routine X ray negative, but in pyelogram small ovoid defect due to uric acid calculus

Fig 8 Case 6 J N Second pyelogram showing uric acid stone in lower calyx producing defect in filling

infrequent in the upper urinary tract and it is only by the most careful methods of study that they are recognized. Many of these patients seem to have suffered a long time and the oft repeated pains or colics are frequently associated with hematurias. The most valuable objective diagnostic criteria are a diminished output of indigocarmine, a positive scratch mark, and a defect in the pyelographic filling of the pelvis on the side of the stone.

URIC ACID SHOWERS

Turning to the question of uric acid showers which produce a clinical picture very similar to that produced by kidney stones—typical colics on one or both sides usually with the presence of red blood cells in the urine—we come to a condition which the older practitioners who allowed urine specimens to stand regularly recognized and which the modern practitioner regularly fails to recognize because he is looking for more tangible sources of trouble. In these patients, as just intimated, there may be no evidence of uric acid in the voided specimen at the time of its passage and microscopically only red blood cells or a few pus cells may be seen. On standing, however, in a preferably sterile test tube such urine will precipitate smaller or larger crystals of uric acid which adhere to the

sides of the test tube and when the tube is shaken the crystals will drop to the bottom and produce the typical brick dust appearance. The reason these crystals are thrown out in passing down the ureter is probably to be found in the fact that all the urine in these cases contain an excess of uric acid which is held in solution not by the water or fluid content of the kidney excretion but by the colloids which are present in the urine. When these colloids, for some reason or other, shake out the crystals a typical attack of renal colic takes place and the patient presents the picture of a typical kidney or ureter stone. The reason that the freshly voided specimen shows no evidence of the uric acid is that these colloids are in part reversible which means that they reverse and again redissolve the uric acid which had been precipitated in the ureter so that when the patient voids the uric acid is in solution once more. On several occasions I have been able to obtain in this way in catheterized ureter specimens a precipitation of uric acid crystals from the side on which the pains had been while from the opposite side no such precipitation in the catheterized kidney specimen has taken place. I have recently studied a case of this sort in which the urine from the right kidney was full of uric acid, whereas the urine from the

opposite kidney precipitated no uric acid. Not so very long ago perhaps 4 or 5 years a patient with repeated attacks of right sided kidney colic who had been under treatment for 8 or 9 months presented this same phenomenon and while the left kidney specimen precipitated no uric acid crystals the right specimen on standing in a sterile test tube precipitated large numbers of such uric acid crystals. This patient was placed on a low protein diet with no meat and he has been free from the attacks of colic which had been bothering him almost daily for 8 months prior to the recognition of the underlying cause of his symptoms. The only way in which a definite diagnosis can be made is to allow the urine preferably catheterized urine to stand from 24 to 72 hours in a sterile test tube. Examination of the specimen if positive, will show the typical brown crystals adhering to the glass and when the test tube is shaken the crystals fall to the bottom in a cluster. The microscopic or chemical tests are rarely necessary to identify these crystals after one is initiated. The blood chemistry so far as the uric acid content is concerned has been of little value as diagnostic evidence.

It will be evident to any one who makes a careful study of his cases that the condition is a very common one and simulates very closely that found in many cases of kidney stone as well as in many of the reported cases of so called strictures of the ureter and kinking of the ureter. I have repeatedly found this condition first on one side and then on the other and that even though a most careful X ray and cystoscopic study is made it is impossible to diagnose the condition except by allowing the urine to stand. We are then able to recover from either the kidney specimens or the catheterized bladder specimens quantities of uric acid crystals 1 to 3 days after the collection of the urine. Some of these

specimens are so highly acid that they remain for months in a sterile test tube without putrefaction. I have one test tube of urine from a patient who has been going the rounds of innumerable offices for years to find the cause of her trouble which apparently was due to uric acid showers. This particular specimen apparently because of its high acidity is still sweet unputrefied after 8 months.

Occasionally though very rarely on making a cystoscopic examination after such an attack one sees the uric acid crystals in the floor of the bladder. In such instances the cystoscopic examination apparently was made at a time before the colloidal reversal had had a chance to take place.

The whole question of uric acid showers is a most practical one and important one. Naturally I will not go so far as to say that all patients whose urine precipitates uric acid on standing have had in the recent past attacks of ureteral or kidney colic. That would be as ridiculous as some other extraordinary claims that have been spoken of in connection with strictures of the ureter. However I believe that I am justified in saying that in patients in whom the X ray, cystoscopic, and pyelographic studies have been negative and who complain of typical ureter or kidney colics, if their urine is allowed to stand and it precipitates uric acid crystals there is some connection between this phenomenon and the syndrome of which the patient complains. The change of diet in these cases to a low protein diet will almost immediately control the symptoms.

From this brief review of the subject that I have brought before you for discussion it must be quite evident that the diagnostic difficulties involved in these two groups of cases can be surmounted and that patients can be relieved of distressing symptoms if they are properly interpreted.

CARCINOID TUMORS OF THE INTESTINES¹

By JOHN A. WOLFER, M.D., F.A.C.S., CHICAGO

From the Department of Surgery of Northwestern University Medical School and the Surgical Service of Wesley Memorial Hospital

FROM time to time, references appear in the literature describing a peculiar small tumor which may be found in the wall of either the appendix or small bowel. This tumor grows slowly, is as a rule not clinically malignant, and yet histologically has many of the characteristics of carcinoma. Because of this rather striking resemblance to carcinoma, it is of intense interest to the pathologist and imposes a keen responsibility upon the surgeon. Recently a case came under my observation which allowed me a rather limited study of this type of tumor.

CASE REPORT

F. L. B., a white male aged 49, entered Wesley Memorial Hospital on March 31, 1925, complaining of frontal headaches and pain in the abdomen associated with vomiting. The headaches had been present since childhood and came in periodical attacks. A bowel movement would often relieve them. Frequently they had the character of sick headaches and the patient would vomit. The pain in the abdomen began about 6 weeks before his entrance to the hospital; it was in the umbilical region and led to belching and vomiting. An attack would last for 1 week, disappear and then recur. The physical examination was essentially negative except for slight rigidity of the right upper rectus muscle. There was no fever; the urine was negative. White blood cells 8,400; red blood cells 3,760,000; hemoglobin 80 per cent. Wassermann negative; stools showed no blood or free fat; tests for hydrobilirubin and bilirubin were negative. Three attempts were made to obtain a gastric analysis but the stomach was always found empty. The X-ray indicated spasticity of the gastric muscle at the third portion suggestive of a lesion in the gastro-intestinal tract. The stomach and duodenum were apparently normal; however, some small mucous erosion which could cause reflex spasticity is not excluded in either the pylorus or duodenum. There were evidences of old appendiceal disease with adhesions of the tip well posterior (Alden). At operation April 14, 1925, the appendix was found adherent. The omentum was knotted as if it had been adherent to some inflammatory mass. Tags of fat were found on the cecum which suggested that this might have been the seat of omental adhesion. The stomach and gall bladder appeared normal. On the anterior wall of the duodenum about 1 inch from the pylorus was found a small tumor about 6 mil-

imeters in diameter, which seemed well localized and firm and the serosa moved freely over it. No enlarged lymph glands were found. The appendix was removed and the duodenal tumor excised. The patient made an uneventful recovery and has remained well to date.

The tumor. On cross section this tumor mass had a grayish white appearance with possibly a yellowish tinge and was firm to the knife. With hematoxylin-eosin stain and under very low magnification the part lying adjacent to the muscular coat appeared lighter in color than the remaining part of the tumor. The mucosa was everywhere intact but seemed thinned. Lieberkuhn's crypts were few and with few exceptions Brunner's glands could be seen only in the periphery. The muscularis mucosae was lost in the mass. In some areas of the mucosa intensive blood infiltration was present and here and there areas of leucocytic infiltration. Lying in and replacing the submucosa were strands and clusters of cells which had a tendency to arrange themselves parallel and at right angles to the mucosa (Fig. 1). Near the mucosa a few indefinite gland-like forms could be seen (Fig. 2). The stroma was moderate in amount, consisting of trabeculae of connective tissue poor in nuclei and smooth muscle. Well developed vessels could be seen in the stroma. On the external side the tumor cells invaded and separated the muscular layer and in one place seemed to have broken into a vein (Fig. 3). The tumor had not extended through the muscle layer. There was no evidence of hyaline degeneration of the stroma. The tumor was not encapsulated. The cells had large oval or round vesicular nuclei, varying somewhat in size and stained rather deeply. The cytoplasm did not take the stain readily and it was extremely difficult to distinguish the type of cell. Some appeared cylindrical, especially those about the periphery of the masses; others cuboidal. No mitotic figures were observed. Quite commonly the cell masses seemed to retract from the encompassing stroma. Many small blood vessels could be seen in the cell masses and the walls of these vessels were in many instances not discernible. As many as 10 to 15 small capillaries could be found in one cluster of cells. No hyaline degeneration of the cell masses and no definite gland formation was observed. No rosette formations were noted.

This general histological picture is not unlike that of adenocarcinoma, but certain discrepancies can be found. The cells appear smaller than carcinoma cells and the cytoplasm stains to a lesser degree. The frequency of capillaries in the cell clusters would

¹Read before the Chicago Surgical Society, February 5, 1926.



FIG. 1. Photomicrograph at 80 diameters showing thinning of mucosa with few Brunner glands. Muculari mucosae absent. Intense blood infiltration of the mucosa. Tumor cells can be seen arranged in strands at right angles to the mucosa.



FIG. 2. Photomicrograph at 140 diameters showing leucocytic and blood infiltration with few glands at lower right hand side. A few gland-like forms can be seen at the top. Muculari mucosae absent.

speak against carcinoma. Many areas look not unlike Langerhans islands because of the lightly staining cytoplasm of the cell, the size of the cell and the frequency of thin walled vessels and capillaries in the clusters.

Sections of this tumor were sent to a number of pathologists and the consensus of opinion was that it was a carcinoid, yet Ewing considered it as probably a malignant tumor. Zeit believed it to be an infiltrating tumor therefore malignant and Mallory, observing the presence of diasters and monasters, considered it a rapidly growing tumor, but not a carcinoma. These differences of opinion led me to undertake a study of this tumor, as well as to search the literature for information.

CLINICAL AND GROSS ANATOMICAL CONSIDERATIONS

It appears from the study of the many cases reported that this process is found most frequently in the wall of the appendix where at times it appears as a diffuse infiltration of the submucosa usually involving the distal end. At other times it manifests itself as a distinct nodule. Cases are reported in which the tumor was found in the duodenal wall (Obendorfer and Hasegawa) and in the jejunum, sigmoid and rectum (Saltykow). The majority appear in the ileum so far as the small intestines are concerned and it is significant to note that it has never been found in

the stomach wall (Ingel). More than one tumor may be present in the same individual and invariably they occupy the antimesenteric side of the bowel wall. Thus 6 nodules all practically the same size were found lying in the antimesenteric border of the ileum (Bunting). Another case disclosed 4 split pea sized nodules in the antimesenteric border of the ileum (Obendorfer). In most instances the mucosa overlying the tumor is intact and only rarely is the serosa involved although such cases have been reported (Hasegawa and Saltykow). In a large percentage of cases there appears a variable degree of invasion of the muscular coat of the bowel wall. In an interesting case (seen by Maresch and reported by Hasegawa) the tumor cells were found invading the mesentery of the appendix and the regional glands showed similar groups of cells.

As a rule the tumor of the intestines gave no demonstrable symptoms during life and was found at autopsy. When the process involved the appendix the clinical diagnosis was uniformly chronic appendicitis and the correct anatomical diagnosis was made only by the pathologist. In a few cases the symptoms were similar to carcinoma of the bowel. Such a case was reported by Ransom. The

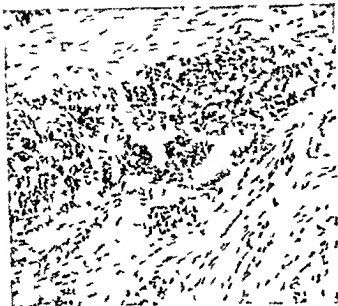


Fig 3 Photomicrograph at 140 diameters showing the invasion of the muscular layer by tumor cells. In the center the tumor cells have broken into the lumen of a vein.

average age at which they are discovered is 50 years. It would appear therefore that the clinical significance of carcinoid lies chiefly in its association with appendix disease and the possibility of malignancy.

MALIGNANCY

From the microscopical picture and from certain clinical evidence, the question quite naturally arises as to whether a carcinoid may produce metastasis and whether at times it may become a truly malignant tumor. In Schopper's case, the primary tumor was the size of a cherry and lay in the antimesenteric side of the ileum, 42 centimeters from the ileocecal valve. Nodules were found in the peritoneum, mesentery, diaphragm and lymph glands. In the metastatic nodules were found the same strand like arrangement of the cells as was seen in the bowel tumor. In the periphery of the alveoli the cells were cylindrical and in the liver the cell masses resembled Lieberkuehn's glands. Certain cell clusters appeared to have a lumen which was filled with a homogeneous mass. One mitotic figure was found but the tissue remained 6 hours without fixing. The conclusions were that the tumor of the ileum caused metastases in the lymph glands, liver, mesentery, peritoneum and diaphragm, and that it was malignant and

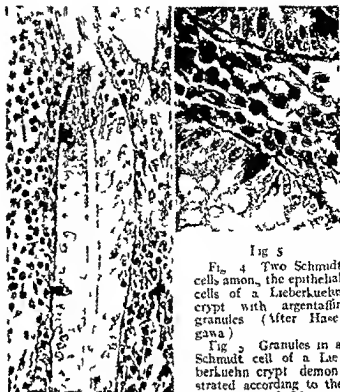


Fig 4

Fig 5

Fig 4 Two Schmidt cells among the epithelial cells of a Lieberkuehn crypt with argentaffin granules (After Hasegawa).

Fig 5 Granules in a Schmidt cell of a Lieberkuehn crypt demonstrated according to the technique of Masson (After Hasegawa).

grew from Lieberkuehn's glands. The Brunner's gland like structures seen were believed to be an anomaly of heterotopic structure of duodenal gland type. In Ransom's case metastases were found only in the liver and it is pertinent to note that in a microscopic section the tumor cells were found to have broken into a vein. The cells assumed a gland like formation and a lumen like area was not uncommon. It was a question as to whether this was a lumen or simply hyaline or mucoid degeneration. This same question was raised by Lubarsch in the description of his case. Verse reports two cases of carcinoid of the bowel in which tumor cells were found in a vein and another case in which tumor cells were found in blood and lymph vessels. In a mesenteric gland the primary tumor being the size of a cherry. A small clump of tumor cells has been found free among blood corpuscles in a mesenteric vein (Burckhardt). In an interesting case of a female aged 39 the peritoneal cavity was filled with a turbid fluid. Multiple small nodules were found in the peritoneum, omentum and right uterine adnexa. There were no secondary growths found in the liver. The



Fig 6 Clusters of tumor cells in a case of appendix carcinoid that have been impregnated with silver (After Hasegawa)



Fig 7 A clump of carcinoid cells under high magnification. The granules are impregnated with silver as in Figure 6

primary tumor was a carcinoid of the appendix. Clumps of tumor cells were found in a vein of a metastatic nodule (Hasegawa). Metastases have also been found in the pleura (Engel). Other cases in which metastases have been observed are reported by Hasegawa, Saltykow, Stenberg, Engel, Schmidt, Evstratoff, and others.

The skeptical and sagacious observer might assume that those so called carcinoids in which metastases have occurred were true carcinomata. It has been noted that the appendiceal carcinoids, in which metastases occurred, have in some instances had larger cells than typical intestinal carcinoids (Hasegawa). Nevertheless a rather typical histological picture is uniformly accepted by those who have studied this tumor. The cells vary in size, some being cylindrical, others cuboidal. The nuclei are oval to round, stain rather deeply, and are placed in the center of the cell or lumenward in the alveoli. The cytoplasm often stains indifferently. The cells in the periphery of the alveoli are often cylindrical, while those in the center may be cuboidal. Small blood vessels and capillaries are found in the cell clusters, and the cells are often arranged around the vessel in a rosette forma-

tion. Gland like formations are frequently present, some containing lumen areas in the center. Ransom accounted for the eccentric lumen by irregular cell proliferation; nevertheless he was not at all sure whether this area with its homogeneous contents was a lumen or hyaline degeneration. The gland like formation is usually observed near the mucosa, while the deep part of the tumor consists of densely filled alveoli. The presence of lipoids can be demonstrated by the examination of frozen sections (Hasegawa), while carcinoma cells contain no lipoids (Maresch). The stroma is abundant as a rule and consists of connective tissue and smooth muscle. The muscularis mucosae is usually split up by the tumor growth and may afford the origin of the smooth muscle. Invasion of the muscularis is the rule rather than any degree of encapsulation, although at times the tissues institute a defense mechanism which is characterized by leucocytic infiltration and by an increase of the size and number of blood vessels in the surrounding tissue.

Saltykow insists that this histological picture is not at variance with misplaced Langerhans islands, and because of the frequent multiplicity of the lesion and the fact that it

is occasionally found in the young he was led to look upon this process as pancreatic rests. This observer questions the fact that the apparent secondary growths are metastases. On the theory that the Langerhans' cells become differentiated in the 3 millimeter embryo while the intestinal muscle does not become differentiated until the embryo attains 10 to 15 millimeters, it may be expected that Langerhans' islands may be found among the muscle fibers of the gut wall as well as in the liver and elsewhere. It may be of interest to add that Saltykow reports finding a clump of carcinoid cells in the center of a mesenteric lipoma. He recognized the chromaffin arrangement in the cells and believed it to be the same as that found in all glands of internal secretion—carotid body, pancreas, and adrenal.

If we consider the cases in which metastases have occurred and apply the theories advanced by certain pathologists, it becomes apparent that a solution may be found in a study of the genesis and nature of the tumor.

GENESIS AND NATURE

This tumor was first described by Lubarsch, in 1888, who believed it to be a primary carcinoma of the bowel, arising from the cells of Lieberkuehn's crypts. In 400 serial sections from such a tumor, he found that the cells at the apex of a Lieberkuehn's crypt broke through their basement membrane and formed a mass which was connected by a strand of cells to other cell masses. He believed that the cells grew into the lymph channels and therefore called this tumor "carcinoma cylindromatosum." The photographs depicting the histology of the tumor were apparently hand drawn and in some ways are not characteristic of typical carcinoid, yet they show the rather characteristic alveolar arrangement with clusters of cells surrounding the capillaries. Considerable hyaline degeneration of the cells was present.

Saltykow reported 7 cases and believed them to be misplaced Langerhans' islands. Aschoff calls them "Schleimhaut naevi," similar to skin naevi. Luce believes them to be basal cell carcinomata. Krompecher speaks of this tumor as a basilloma, growing from

intestinal cylindrical cells, and describes similar tumors in the nose, breast, prostate, uterus and stomach. Engel and Mathias agree that it is the result of an embryonic rest, Engel calling it a choristoblastoma (ontogenetic), while Mathias calls it a progono-blastoma (phylogenetic).

The fact that the cells in the alveoli seemed to retract from the stroma, led Obendorfer to the theory that the alveoli were distended lymph spaces and that the tumor was of endothelial origin, but Evstratoff and Kreidenko found by special stains that each clump of cells was surrounded by a definite tunic of elastic fibers.

In 1910 Huebschmann suggested the possibility that the cells of carcinoid might evolve from certain cells lying in Lieberkuehn's crypts, either the Paneth cell or the Schmidt chromaffin cell, more likely the latter. It has been demonstrated that in the cytoplasm of the cells of carcinoid are granules which stain red with eosin and hematoxylin and that these chromaffin granules will reduce silver (Figs 6 and 7). Furthermore it can be shown (Figs 4 and 5) that the granules in the Schmidt chromaffin cells can be impregnated with silver and the cell lying among the epithelial cells of Lieberkuehn's crypts clearly demonstrated (Masson). Furthermore there have been pointed out vacuoles beside the silver impregnated granules lying in the cytoplasm, which have proven, upon frozen section examination, to contain lipoids. In this respect they closely resemble the cells of the adrenals and other chromaffin cells of the endocrine system (Masson). This led Masson to call carcinoid tumors "Tumeurs endocrines de l'appendice" (endocrine tumors of the appendix). Hasegawa, working independently of the idea of Masson, demonstrated the same relation and staining characteristics of carcinoid cells and came to the same conclusions. It is interesting to note that in 2 cases studied in which malignant changes were associated with carcinoid, no argentaffin cells could be found (Hasegawa).

The findings of Hasegawa and Masson agree with the theories of Saltykow, Engel and Mathias as to the nature of the cells that is, they belong to the chromaffin system.

and simulate cells of the pancreas, adrenal and carotid body. So far as the genesis or origin of the tumor is concerned their findings are confirmed by Lubarsch, Luce, and Krompecher. Even Aschoff's theory can be adjusted to conform which is that carcinoid cells have their origin in specific cells lying in Lieberkuehn's crypts.

As to the possibilities of malignancy in carcinoid certain features of the tumor should be taken into consideration. Most of these tumors remain small and innocent and when removed have no tendency to recur. Even in cases in which lymph glands are secondarily involved the removal of the tumor with the glands brings about a cure (Warthin). Whether this tumor cell has its origin in the endoderm, mesoderm or ectoderm it has the potentialities of malignancy. The fact that carcinoid cells so frequently invade the muscularis of the bowel yet do not recur after scanty local removal suggests the character of an infiltrating benign tumor like a glioma, yet a glioma does not produce metastasis.

In an effort to study the endocrine nature of the Schmidt Ciacco cell, Masson examined 200 serial sections of an appendix. These observations and those of Maresch brought forth some rather startling possibilities. In the wall of the chronically inflamed appendix can be found an overgrowth of the sympathetic nerve fibers to form plexiform neurofibromata and lesions with ganglion cell like structure which simulate amputation neuromata of the peripheral nerves. Argentaffin granules can be demonstrated in these cells by silver impregnation and in serial sections it is found that the cells grow from cells in Lieberkuehn's crypts. The cells have a tendency to dip downward toward the muscularis mucosae and develop short nerve fiber like projections. They never grow beyond the muscularis mucosa. Masson describes four types of these cells: the neuroglial type resembling neurolemmal cells with a poorly defined cell wall (few), the ganglionic type with Nissel like bodies in the cell, the glandular type with argentaffin granules and lipid vacuoles, and the intestinal type with cuboidal or cylindrical cells with central nuclei surrounding a lumen like area. He concludes that since the argentaffin

cells in pathological cases are associated with the building of new nerve fibers the sympathetic nervous system of the mucosa of the gastro intestinal tract is derived from the endoderm. As a result of chronic irritation the argentaffin cells begin to reproduce and invade the surrounding tissues to form neuromata. Beside these neuromata epithelial like structures may be formed. When the tendency to the formation of neuroma falls to the background carcinoids may form the type of structure depending upon the type of cell.

If correct, these findings and conclusions would open a great field for speculation. It seems reasonable to assume from the observations of Masson and Hasegawa that carcinoid grows from specific cells which lie in Lieberkuehn's crypts. Further independent work must be done to establish this as a fact and since a rather elaborate technique must be used for fixation as well as for the staining only the early recognition of this tumor will afford the surgeon and pathologist the opportunity.

The small portion of my tumor which remained after sections for ordinary staining had been taken was subjected to the silver impregnation technique of Hasegawa but, due to the thinness of the specimen the experiment was unsuccessful and we were unable to demonstrate the argentaffin cells. I am therefore submitting from the work of Hasegawa some photographic reproductions of these cells, as well as the Schmidt cell (Figs. 4, 5, 6, and 7).

CONCLUSIONS

It would seem entirely possible to correlate scientifically the many theories which have been advanced in regard to carcinoid and to formulate the following conclusions:

1. The carcinoid cell belongs to the chromaffin system.
2. Carcinoid originates most frequently from the Schmidt cell of Lieberkuehn's crypt but it may take its origin in misplaced Langerhans islands or other chromaffin cells.
3. Carcinoid cells may infiltrate the surrounding tissue and yet the tumor remain benign.

4 A carcinoïd may, under certain conditions not yet understood, become a malignant tumor and produce metastasis

5 There may be a relationship between carcinoïd and chronic inflammatory and sympathetic nerve changes in the gastro-intestinal tract

BIBLIOGRAPHY

- 1 ASCHOFF L. Path Anat 1923 ii 809
- 2 BUNTING C H. Multiple primary carcinomata of the ileum. Johns Hopkins Hosp Bull xv 389
- 3 BURCKHARDT I L. Zur Lehre der kleinen Duenn darmkarzinome. Frankfurt Ztschr f Path iii 593
- 4 Idem. Ueber das kleine Duenn darm und Appendix karzinom. Frankfurt Ztschr f Path xi 219
- 5 ENGEL D. Sind die Carcinome Progonblastome? Arch f path Anat, 19 3 cccxlv 38
- 6 LASTRATOFF and BREIDENKO. Ueber eine Beobachtung von multiplen primären kleinen Duenn darmkarzinomen mit metastasenbildung. Schweiz Aerztl Mitt, 1911 p 301
- 7 HASEGAWA T. Ueber die Carcinome des Wurmfortsatzes und des Duenn darmes. Arch f path Anat 1923 cccliv 8
- 8 HUEBSCHMANN P. Sur le carcinome primitif de l'appendice vermuculaire. Rev med de la Suisse Rom, 1910 xxx 317
- 9 KROMPECHER. Der Basalzellenkrebs. Jena 1903
- 10 LUBARSKY O. Ueber den primären Krebs des Ileum nebst Bemerkungen ueber das gleichzeitige Vorkommen von Krebs und Tuberkulose. Arch f path Anat cv 280
- 11 IVEL G. Ueber sog primäre Karzinome (Schleimhautnaevi nach Aschoff) und primäre Karzinome des Wurmfortsatzes. Beitr z klin Chir 1912 lxxii, 155
- 12 MARESC H. Ueber den Lipoidgehalt der sog Appendixkarzinome. Muenchen med Wchnschr 1913 iv 189
- 13 Idem. Ueber das Vorkommen neuromartiger Bildungen in obliterierten Wurmfortsatzes. Wien klin Wchnschr 1921 xxiv 181
- 14 MASSON P. Imprégnation argentique du pigment. Compt rend Soc de biol 1913 lxxv 210
- 15 Idem. Les nevromes sympathiques de l'appendicite obliterante. Lyon chir 1921 xviii 281
- 16 Idem. Les lésions nerveuses de l'appendicite chronique. Compt rend Acad d Sc, 1921 clixvii 262
- 17 Idem. Les lésions du plexus nerveux periglandulaire dans l'appendicite chronique. Soc méd des hôp de Paris 1922 lxvi 956
- 18 Idem. Ann d Anat path 1924 i No 1
- 19 MATHIAS E. Zur Lehre von den Progonblastomen. Arch f path Anat 1922 ccxxvii 44
- 20 OBENDORFER S. Multiple primäre beginnende Carcinome des Darms. Beitr z path Anat 1901 xxiv 519
- 21 Idem. Carcinome Tumoren des Duenn darmes. Frankfurt Ztschr f Path 1907 i 426
- 22 RANSOM W B. A case of primary carcinoma of the ileum. Lancet 1890 ii 1020
- 23 SALTZLOW S. Ueber die Genese der Karzinoiden Tumoren sowie der Adenomyome des Darmes. Beitr z path Anat 1912 li 559
- 24 SCHOPPER K J. Ein kleines Duenn darmkarzinom mit angedehnter Metastasenbildung. Verhandl d deutsch path Gesellsch 1913 xvi 387
- 25 SCHMIDT J L. Beiträge zur normalen und pathologischen Histologie einiger Zellarten der Schleimhaut des menschlichen Darmkanals. Arch f mikr Anat 1905 lvi 12
- 26 SCHMIDT M B. Ueber multiple kleine Duenn darmkarzinome. Protokoll. Muenchen med Wchnschr 1917 xlii 2250
- 27 VERSE. Die Histogenese der Schleimhautkarzinome. Verhandl d deutsch path Gesellsch 1908 xii 93
- 28 WARTHIN A S. A personal communication

THE RELATION OF PROGNOSIS TO THE HISTOLOGICAL FINDINGS IN CARCINOMA OF THE CERVIX¹

BY ALFRED PLAUT M.D. NEW YORK
Pathologist The Woman's Hospital

THE conclusions that are submitted in this paper are the result of a study of the material (with a few exceptions) from patients admitted to the hospital for radium treatment of cervical carcinoma under the direction of Dr. George Gray Ward, the Chief Surgeon and Dr. Lillian K. P. Farrar. They presented their 5 year end results before the American Medical Association in May, 1925.

From the standpoint of the pathologist we have felt some hesitancy in complying with the desire of the surgeon to give a prognosis in these cases in accordance with the type of tumor cell. It seemed impossible to determine the fate of a patient who has malignant disease solely according to the shape and to other visible characters of cells as can be demonstrated in stained sections. Too many other factors seemed as important or more important factors determined by the cells by the tumor as a whole and by the constitution, condition and environment of the patient. A rapid survey of a group of cases seemed to justify this opinion and in a discussion on uterine carcinoma before the American Medical Association in 1924 our standpoint was brought forward by Dr. Ward.

The first thing to be done was to exclude any possibility of autosuggestion since the work was started with a definite idea concerning the outcome. This was accomplished by first gathering all the histological data without any knowledge of the case they belonged to. Very many cases were studied. In 149 cases the clinical and anatomical data were considered sufficient for drawing conclusions.

The classification of Martzloff was followed as far as possible because after the publication of his extensive and elaborate study the interest, in some instances even the enthusiasm in histological prognosis has been aroused as far as cancer of the cervix is concerned.

Martzloff established four types of cervical carcinoma, one of which the adenocarcinoma is chiefly characterized by its form of growth while in the three others the type of the tumor cell is the means of differentiation. This difference in the origin of the group and other difficulties connected with adenocarcinoma of cervix induced us to consider the adenocarcinoma separately from the other groups.

The cells which are characteristic of the three groups of epidermoid carcinoma of cervix are the 'spinal cell' the "transitional cell" and the 'fat spindle cell'. Martzloff wants only to make a statement on the morphological appearance of the different cell types not on the histogenesis. The term "spinal cell" literally has the same meaning as the generally used word prickly cell in indicating the existence of intercellular protoplasmic bridges, these however, can be seen in a rather small number of epidermoid carcinomata only. The other characteristics given for the 'spinal cell' are those of the upper layers of the cervical epithelium. The 'transitional' cell type corresponds to the lower layers of cervical epithelium except the stratum germinativum itself. Martzloff makes no statement about their shape and he is right in not doing it. The third group the "fat spindle cell" is described as a broad spindle shaped cell. Martzloff immediately adds the remark that the growth would probably be termed basal cell cancer by many observers. True to his merely morphological not histogenetic standpoint, he avoids the term basal cell. Intending to follow Martzloff we avoided the term basal cell carcinoma also but insidiously the familiar term found its way into the histological notes as the typical pictures of basal cell cancer came under our eyes. In most of these cases the appearance of the single cells made us group these tumors finally as "transitional" with a more or less

¹ From the clinic of the Woman's Hospital. Presented in part before the American Association of Pathologists and Bacteriologists, Albany New York, April, 1926.

marked admixture of spindle cells. While in Martzloff's material a group of "broad spindle" cell carcinoma appears, no such group could be established among the cases from the Woman's Hospital. There are only some cases in which the admixture of spindle cells was especially conspicuous. It is preferable to show from the beginning the difficulties which have been encountered in following the histological classification. It probably will be that way with any classification which tries to rely only or chiefly on the type of cell in cervical carcinoma. The cell forms vary too widely—no nomenclature can successfully cope with their manifoldness. The task seems as hopeless as the one of finding a name for each shade of purple or violet between the blue and the red. In spite of the difficulties mentioned and to be mentioned later and although probably more sources of error exist which are unknown to us, it shall be endeavored to group our material according to Martzloff and to compare the therapeutic results with the group to which the cell-type makes them belong.

Two groups widely differing in character may be shown first (Table I-A.)

TABLE I-A —THIRTEEN CASES WITH FIVE-YEAR CURE—THEIR DISTRIBUTION AMONG THE CELL TYPES

Cell type	Number of cases
Spinal with hornification	3
Spinal without hornification	3
Spinal and transitional	1
Transitional	1
Transitional and Spinal	1
Transitional mixed with Spindle	1
Adenocarcinoma	1

TABLE I B —DEATH IN 1 YEAR

Cell type	Number of cases
Spinal with hornification	1
Spinal without hornification	2
Transitional	1
Transitional and spindle cells	1
Adenocarcinoma	1

With these 13 cases, 6 cases will be compared where death occurred in the first year after onset of symptoms. Treatment was started while the cases belonged to class 1 or 2.¹ Since the prognosis generally is con-

sidered better in class 1 or 2, there must be something else which was the cause for the rapidly fatal course of the disease and it is obvious to look for it in the histological picture (Table I-B).

(The term "without hornification" means only that in the slides which have been examined, no hornification has been found, but by no means a definite statement on its presence or absence in the tumor as a whole.)

The figures of these two groups in spite of their wide clinical divergence show no striking difference in the distribution among the cell types.

The figures for a group of 3 and 4 year cures are similar (Table II).

TABLE II —THREE AND FOUR-YEAR CURES

Cell type	Number of cases
Spinal with hornification	3
Spinal without hornification	4
Spinal with hornification and transitional	1
Transitional	2
Transitional and spinal	1
Spinal transitional and spindle	1

This may be compared again with Table III.

TABLE III —TWENTY-SEVEN CASES BELONGING TO THE CLASSES 3, 4 AND 5 IN WHICH DEATH OCCURRED WITHIN ONE YEAR

Cell type	Number of cases
Spinal with hornification	4
Spinal without hornification	9
Spinal and transitional	1
Between spinal and transitional	4
Transitional with some spinal	2
Transitional	3
Adenocarcinoma	1
Undefined	2
Between transitional and spindle	1

Here too no outstanding differences could be found in the distribution of cures and of cases with rapid progress.

The frequency of spinal cell carcinoma seems much higher in our material than it is according to Martzloff's figures. Apparently the borderline between spinal (without hornification) and transitional has been drawn differently by Martzloff and by us, it can hardly be otherwise. Krompecher himself, who introduced the term basal cell carcinoma, draws no definite borderline between basal

¹ Schmeiss classification was used.

cell carcinoma and squamous carcinoma without hornification. This means, in the terminology of Martzloff between "transitional" and "spinal"

TABLE IV — DISTRIBUTION OF THE 3, 4 AND 5 YEAR CURES UPON THE CELL TYPE

Cell type	Number of c
Spinal with hornification	8
Spinal without hornification	7
Spinal and transitional	2
Transitional	8
Adenocarcinoma	2

TABLE V — DISTRIBUTION OF THE CASES REPORTED DEAD

Cell type	Number of c se
Spinal with hornification	21
Spinal	40
Spinal and transitional	7
Between spinal and transitional	7
Transitional—including admixtures of spinal and spindle	25
Adenocarcinoma	7
Undefinable	3

We purposely refrain from establishing percentages. In our opinion this should be done with larger figures only. The direct comparison of the figures will throw sufficient light on the problems in question and the fractions given in some instances may be helpful (Table VI)

TABLE VI — SURVIVING RATES

Cell type	F ct n
Spinal with hornification	1/3 33
Spinal without hornification	1/5 45
Combined spinals	1/4 53
Same with addition of spinal and transitional and of between spinal and transitional	1/4 61
Adding same to spinal without hornification	1/5 20
Transitional	1/5
Transitional with addition as before	1/4 66

The only outstanding result of these tables is the larger surviving rate of the *spinal* (squamous) cell carcinoma *with hornification*. The group of the spinal cell carcinoma without hornification has even a lower surviving rate than the group of the transitional cell carcinoma. The cases which had to be classified as spinal and transitional or as between transitional and spinal were added to the total of the spinal the spinal without hornification and the transitional in order to find out whether one of these groupings would yield a clear result

The most logical grouping seems the addition of such mixed and intermediate cases to the group spinal without hornification. The nearly identical surviving rates of spinal without hornification and of transitional show that the aforementioned difference in grouping does not affect the results of this investigation. The cases in question either belong to the spinal without hornification or to the transitional. Thus their being shifted from one group into another leaves the statistical result unchanged.

As mentioned before, a group of fat spindle cell carcinoma could not be established from our material, but in order to have some comparison, those cases were put together in which the presence of spindle cells was especially mentioned. Before giving the astonishing results of this table the reader is again reminded of the fact that the whole histological examination was done before any charts or follow up records were available.

TABLE VII — CASES IN WHICH THE PRESENCE OF FAT SPINDLE CELLS WAS CONSPICUOUS

Age	Class	Time of onset to last treatment	Outcome
34	3	unknown	Cure
35	2	9 months	Died after 1 year 2 months
71	3	6 months	Died shortly after treatment
38 operable	3	months	Died after 6 months
55	3	20 months	Died after 3 years
66	3	9 months	Died after 2 years 6 months
34	2	unknown	Cured
40	1	4 months	Cured
47	3	1 year	Cured

It is impossible to draw any positive conclusion from these few cases. But even such small numbers must arouse heavy doubts as far as the bad prognosis of the fat spindle cell carcinoma is concerned when we see the four cures among nine cases. This accumulation of cures it may be repeated, is only one of the pranks which in statistics with small numbers chance loves to play.

TABLE VIII — DURATION OF LIFE—(TIME FROM ONSET OF SYMPTOMS TO DEATH)—IN RELATION TO THE CELL TYPE

Cell type	Average duration
Spinal with hornification	1 year and 8½ months
Spinal without hornification	1 year and 4 months
Spinal and transitional	1 year and 9½ months
Transitional	1 year and 4 months

In attempting to give an explanation of these figures, one may say the progress of disease very frequently was rather slow in the earlier forms with horny pearls. This fact finds expression in the relatively long duration of life in spinal with hornification compared with the figures for spinal without hornification. The group spinal and transitional includes some cases with hornification, and this may possibly account in part for the long duration of life. In this table as well as in Table VI there are nearly identical figures for the transitional and for spinal without hornification. It hardly needs to be mentioned that numerous other things have their influence upon the duration of life.

The conclusion from the foregoing tables is that the cell type does not enable us to make a prognosis in cervical carcinoma. As far as the relatively low malignancy of the spinal cell carcinoma is concerned, this seems to be the fact only when we consider the cases with hornification separately. It will be seen later that even this statement, which refers only to long known things, does not survive critical analysis without some restrictions.

The discrepancy which exists between the figures from Martzloff's material and the results from the material we have, remains to be explained. It would lead much too far to bring before the reader the whole painstaking but interesting analysis which had to be undertaken. However, the importance which is attributed to our problem seems to justify one in showing by means of a few examples how many-sided the whole question is and how difficult it is to draw positive conclusions even in presence of figures which seem to give clear results.

The operative material at Johns Hopkins Hospital consisting of specimens from hysterectomies enabled Martzloff to make interesting observations on the extension of the tumor growth. He states (page 145) that carcinomata, belonging to different types, grow through the whole length or thickness of cervix with approximately the same speed. Martzloff's Table IV shows in a convincing way the relation of broad ligament involvement to the thickness of cervix involved. Further he points to the particular significance of this

fact since none of the patients with true broad ligament involvement survived. Does this not constitute an uninterrupted chain of evidence that for the greater portion of Martzloff's material one of the chief determining factors in prognosis was given by the rate of penetration, independent from the cell type? For the gynecologist and the practitioner this means that they will continue to rely first on the result of bimanual examination, well aware certainly of the fact that they may mistake a surrounding hard inflammatory mass for carcinomatous involvement.

Table II in Martzloff's paper brings a group of 15 cases in which the prognosis seemed to be very poor clinically. But the patients lived for a long time, some with radium treatment, others only submitted to curettage and cauterization of cervix. Of these 15 cases 3 belonged to the spinal group, the one patient living for 3 years, the other two for 1 year. Ten of the cases were transitional, living 1 year, 2, 4, and 7 years respectively, there were 2 fat spindle cell cases in this small group, their duration of life being 2 years. The astonishing feature is that the majority of these 15 favorable cases do not belong to the histologically benign types and that the group of fat spindle cell carcinoma which is so small in itself and which is supposed to be a fast killing type nevertheless has 2 cases in the small group of 15 unexpectedly long living cancer patients.

Our material furnishes a clinical parallel to Martzloff's Table II. Sixty-three patients who, 6 months or less after onset of symptoms, belonged already to class 3, 4, or 5, had an average duration of life of 1 year and 4 months, while the average for all cases is 1 year and 9 months. Their survival rate, 7 in 63, is correspondingly low. The difference in duration and in survival rate which these cases exhibit in comparison with the figures for the total are much more marked than any grouping according to the cell type shows in our material.

The figures of survival after operation as given in Martzloff's Table XII indicate a relatively high malignancy for adenocarcinoma and spindle cell carcinoma, while the more favorable figures for spinal and transitional

are equal. But this table assumes a different aspect when we consider the time of operation as far as it is given. Among the 51 surviving patients in the transitional group, 18 or one third have been operated within 3 months after onset of cancer symptoms. It is the same with 3 or one fifth of the spinal cases. On the other hand the 4 patients with adenocarcinoma have been operated upon 6, 10, 18 and 24 months after onset of symptoms and the corresponding figures for the 5 fat spindle cell cases are 4, 6, 8, 10 and 18 months. In the groups of transitional and spinal there are 2 cases only with operation 2 years after onset of symptoms, thus giving no counterbalance for the many early operations. The question remains open how the surviving figures would be when taken for cases with corresponding time of operation.

The few examples given may show once more how complicated all these questions of malignancy are and how dangerous it is to draw positive conclusions from the material even in a large operative service. Figures of apparent value may completely change their meaning when the material is grouped differently.

After this demonstration of our material, we may be allowed to go back to the consideration which made us from the beginning oppose the idea of prognosis following the cell type.

Let us assume that certain cell types—merely morphologically—could be agreed upon by a majority of observers. Even so in our opinion the cell types would not give a means of prognosis: the size, shape and staining properties of a cell may be changed by accidental secondary factors to such a degree that the judgment which is based on the stained section must be erroneous concerning the biological value of the cells. A relatively small cell with indistinct outlines, fairly well staining plasma and a small nucleus may become imbibed with fluid for instance and assume a larger size, a different shape. Its outline may become fairly distinct, the tinctonal character of the plasma may change and the small dark nucleus imbibed with fluid appears larger, more rounded and less rich in chromatin. This is not a theoretical construction; it is the description of many slides in which it remains

uncertain whether the cancer cell was from the beginning and by its own nature large and clear or whether oedema or something else made it like that. Fatty change and infiltration with glycogen can do the same. The contrary may be done by anaplasia. A cell which originally was large with pale plasma and large clear nucleus may appear small with scant protoplasm and small pyknotic nucleus after the secondary change has taken place which is called anaplasia since Hansemann. But we have no reason to assume that the malignancy of the tumor as far as it is connected with the form of the cell has changed toward the character of the other type of tumor to the cell form of which its cells have become similar accidentally.

The assumption that it would be possible to make the histologists agree on a few types of cells is far from being true and it hardly can be made true at all. The first reason for this is again the manifoldness of the cell forms with the mixing up of the characters of different groups in one cell. There are cells which show the outstanding character of the spinal group: the prickles, namely, but their shape does not at all correspond to the characters of spinal and the cases are few in which mechanical pressure can be demonstrated as having brought on this change in form and in size. Much more frequent are the typical spinal cells, typical in every respect but without the prickles from which they are named.

The whole problem of basal cell carcinoma is unsettled. Many authors have tried in many papers to correlate the different forms of tumors in the skin as well as in the cervix with the different layers of cells. It will not be possible to keep the term basal cell carcinoma out of the discussion on cancer of cervix: the pictures are too much similar to those in the skin if not identical with them. But due to the divergent opinions on basal cell cancer different pictures especially when we are nearing the borderline are given this name. Thus as mentioned before, Martzloff for instance thinks that his fat spindle cell cases are most similar to the basal cell cancer while in our opinion the transitional cases correspond to the basal cell tumors. This would make an enormous difference in dealing with the ques-

on of frequency of the basal cell carcinoma of the cervix Martzloff apparently considers an unfrequent thing, but Alter calls the majority of cervical cancers basal cell carcinoma. Tumors which exhibit one of the typical cellular forms of basal cell carcinoma while the single cell corresponds to another class of tumor make classification exceedingly difficult. The situation is no better when we see large tumor cells with small pyknotic nuclei or large areas of typical basal cell growth and beautiful corn pearls in other spots. Virchow's dictum that even the richest imagination could not possibly conceive all the forms of the cancer is true for carcinoma of the cervix.

After having seen that in establishing relations between cell type and malignancy the lack of exactly definable cell types is a so far unmountable difficulty, let us face the other half of the problem and try to establish agreement on the conception of malignancy that could seem useless to question the existence of such an agreement existing throughout the whole medical world as far as outspoken carcinoma is concerned. But difficulties and misunderstandings have arisen lately and will tend to handicap us if we do not recognize

Before the time of radiation the clinical picture of malignancy in cervical carcinoma was simple. Since the distant metastasis does not play an important role, it was a question of local destruction, local recurrence to a very small extent of general cachexia. After the introduction of radiation has supplanted the merely mechanical agent of operation by a biologically acting factor upon which different biological systems (cells, tissues, organs, organisms) may act and must act differently. In the literature of the last decade this new factor has not always been considered with enough keenness. When we read now of a very malignant tumor, then we must ask what the author means, whether a tumor is growing very fast, which is apt to relapse after operation and apt to make general metastases or a tumor which is resistant against radiation. The latter may not necessarily go along with the other characters. And more difficulties are involved. Is the tumor refractory to radiation with roentgen rays or with radium?

How does the tumor behave under light repeated radiations, how after application of one massive caustic dose? Or to put it in the terms recently used by Ewing, how is the tumor affected by the three different principles which are active in radiation, namely the autolytic degeneration, the caustic destruction, and the growth restraint? It is obvious that results obtained with one of these principles or with a method in which they are active in different proportions can not be compared with each other and certainly not with operative results. Here again similar histological pictures may belong to quite different processes.

Increase in connective tissue in the previously or still cancerous region is generally considered as a sign of healing. Little matters whether we believe that the connective tissue has been stimulated by the radiation and thus been enabled to outgrow the cancer, or that the vitality of the tumor cells has been lowered by the rays. The final effect is the same. But the connective tissue, especially when thick and hyalinized, may act in the opposite direction by walling off living cancer cells and keeping them protected from endogenous or exogenous agents which might destroy them otherwise (Ewing).

The changes which have been brought upon the conception of malignancy by introducing radiation are most conspicuous in the hornified squamous cell carcinoma. After having been considered the least malignant form of cervical cancer it has shown a higher resistance against radiation than other forms which otherwise are believed to be more malignant. *This leads to the paradoxical state of affairs that we give a more energetic treatment in the less "malignant" case.* Tumors with undifferentiated cells are generally fast growing and malignant, but undifferentiated cells are generally susceptible to radiation thus opposing again two different conceptions of "malignancy". No wonder that the opinions concerning the different forms of cervical cancer are numerous and subject to change. The literature contains the suggestion to exclude unripe forms from radium treatment and to treat especially the riper spinal forms

¹ A similar statement has been made by L. A. Pomeroy and A. Straus
J. Am. M. Ass. 1924 LXXXII 1060

(Adler) The opposite idea that the squamous cell carcinoma is more resistant has been expressed by Dannreuther and others but the intermediate standpoint exists also that intermediate forms give the best results (Kehrer) P Klemperer states that his opinion on the radioresistance of different cervical cancers is undergoing changes He is quite right in adding immediately that the number of other determining factors makes it difficult to select cases suitable for comparison

The increasing use of radiation and the corresponding decrease in the number of hysterectomies adds further difficulties since less material is available for the pathologist

In preparing this paper the literature was not studied before all conclusions were drawn It was a great comfort to the author to find himself in accord with several very prominent gynecologists and pathologists who have expressed their opinion on the subject in discussions at the German Society for Gynecology in 1922 and 1923

Borst the author of the textbook on tumors has tried to establish relations between clinical groups and the histological picture His result was negative he does not see his way clear concerning the importance of the more mature forms of cervical cancer and the less mature ones Borst does not know, as he states whether such relations will be found later on or not Bernhard Fischer has examined the material from Walther's service for 4 years with the result that histological prognosis is impossible The judgment from the University of Tuebingen (Mayer) is that so far the question can not be decided Kuestner has expressed his opinion years ago that the histological picture gives no prognostic judgment In Cullen's standard work no opinion is expressed on this matter

Rather interesting is the carefully expressed conclusion at which Schottlaender and Kermauer arrived after years of study on the large material in Vienna 'It is obvious that the results as given above are little encouraging so far as a prognosis from the examination of curettings or excisions is concerned The last paper published on our subject (Cordua) represents the opinion of Schroeder and leaves the question open

Without wanting to establish any methods or groups or types, the author felt tempted to give a general impression from the histological picture as any tissue man may do Putting down in the histological description one of the four terms regular, fairly regular irregular or very irregular—a summary judgment was ventured on the picture as a whole without reference to any special feature A slide labeled "very irregular" can be from a squamous cell carcinoma as well as from a fat spindle cell tumor or anything else Taking the averages for the duration of disease (from onset of symptoms to death), it resulted that in the cases the slides of which were labeled "regular" the average duration was 1 year and 10 months for the cases designated as "fairly regular" and "irregular" it was 1 year and 8 months, but all slides bearing the sign "very irregular" belonged with one exception to patients who died within 1 year The one patient lived for 2 years and 6 months¹ The average duration of life for these cases was 11 months The short duration of cancer symptoms before the first treatment seems to indicate that the very irregular histological aspect was not the picture of a final stage Neither anemia nor leucocytosis nor fever played an important rôle Several cases in their rapid progress reminded of the acute carcinosis of breast Seven of these 10 cases belonged to the spinal type 2 were spinal and transitional mixed one was transitional This group of especially malignant cases did not show a characteristic distribution among the cell types either As far as our knowledge goes it is the same with the acute carcinosis of breast The marked parallelism between very irregular histological picture and rapid progress toward death is worth while to be mentioned but everybody has to make a diagnosis like that for himself *it will not do to compare the findings of different investigators on this point*

The form of growth was studied carefully the thickness and arrangement of cell strands the relations between cells and stroma the amount character and localization of inflammation, the number and character of

¹ B t for the o e extraordinary c se w th yea and 6 m ths, thr
ave age duration w ld be 1 w 8 1/2 mo ths

figures. All the data were compared the clinically different groups of cases the results were entirely negative. The table contains several statements on the favorable or unfavorable meaning of different kinds of inflammation for instance, but nothing definitely convincing. Special consideration was given in our material to the eosinophile cells but without result.

Comparison of the hæmoglobin percentages, a number of leucocytes and the relative number of polymorphonuclear and other blood cells did not lead to any definite conclusion. Anæmia played no important role in the course of the disease, there were no living differences in the hæmoglobin of living and death cases and none in cases with longer and shorter duration of symptoms. The parallelism between disease and anæmia is practically the same as it used to be in patients of any kind.

A grouping of the patients according to age with different statistical controls gave the impression that the prognosis is very poor for women under 30 years. None of the young patients in this group was cured and the duration of life was as short as in the above described group of the very irregular cases. But for the years between 30 and 40 the outlook is not much worse than for the fifth decade which furnished the majority of cases. Neither is there much difference between the first and the second half of the fourth decade. But the generally accepted idea that the older the patient the better the prognosis seems to be confirmed by our figures.

TABLE IV.—DURATION OF LIFE IN RELATION TO AGE

Age	Number of cases	Average duration
20	7	10½ months
20-29	0	1 year 7 months
30	44	1 year, 0 months
30-39	27	1 year 10½ months
40-49	18	1 year 11½ months
50	2	2 years

Only death cases constitute the material of this table. Theoretically the cures ought to be included and their expectation of life in general statistics give ought to be used,

but such attempts at accuracy are useless since our clinical statistics are incomplete.

The number of cures, however, in relation to the age of patients gives a different result (Table X).

TABLE X.—NUMBER OF CASES IN RELATION TO AGE

Age	No of cases	Deaths	Cures	Proportion of cures
20-29	12	12	None	
30-39	39	34	15	1/2 6
40-49	59	43	16	1/3 7
50-59	46	36	10	1/4 6
60-69	21	19	2	1/10 5
70	9	8	1	1/9

This seems very peculiar, no cure under 30 years, but from 30 years on the relative number of cures becomes rarer with age. We are unable to give an explanation but there are statistics with very large figures and similar paradoxical results, Weibel of Vienna reports on 2,478 cases of cervical carcinoma, that he finds the percentage of operable cases going down with age and the percentage of recurrence nearly equal in different ages. In his table the cases under 30 years have the highest percentage of operability.

The number of children showed no peculiar relation to the occurrence or course of the disease, neither did the time which had elapsed since the last delivery. The figures correspond to the statements in the literature when adapted to the general statistics of the City of New York. Fifteen per cent of the cases occurred in nulliparæ.

The question of adenocarcinoma of cervix has been omitted in this paper. The number of our cases is not large enough to give anything decisive and the reports in the literature are very contradictory. Furthermore in our time of radiation it is difficult to be sure about the origin of an adenocarcinoma which clinically is a tumor of cervix.

CONCLUSIONS

1 We have today no reliable basis for a histological prognosis in cervical carcinoma.

2 The histological picture of cancer of cervix does not permit of establishing well defined groups according to the type of cancer cell.

3 In speaking about malignancy several points must be considered separately especially in relation to the different principles which are active in radiotherapy

4 The constitutional factors must be considered in determining prognosis

5 The influence of age must be studied anew since the existing data are unsatisfactory

6 The clinical classification of carcinoma of uterine cervix is still the best aid in making a prognosis

7 The general histological aspect of the tumor may be an aid in prognosis

LITERATURE

ADLER L. *Centralbl f Gynaek* 1916 xl 6,3

ALTER J. *Med Research* 1919 xl 241

BORST. *Verhandl d deutsch Gesellsch f Gynaek* 1923

CORDUA. *Virchow's Arch f path Anat etc* 1923 pp 254-499

CULLEN. *Cancer of the Uterus* 1909

DANNREUTHNER. *Am J Obst & Gynec* 1925 May

EWING. *Radium report of the Memorial Hospital Sec Series* 1923

FISCHER BERNHARD. *Verhandl d deutsch Gesellsch f Gynaek* 1923

KEHRER. *Verhandl d deutsch Gesellsch f Gynaek* 1923

KLENPERER PAUL. *Am J Obst & Gynec* 1925 May

KROMPECHER. *Ztschr f Geburtsh u Gynaek* 1919 lxxxv 299

KLESTNER. Quoted from Liegner. *Beitr z Geburtsh u Gynaek* 1913 xviii 329

MARTZLOFF. *Johns Hopkins Hosp Bull* 1923 xxv 143 and 184

MAYER. *Verhandl d deutsch Gesellsch f Gynaek* 1923

SCHOTTLAENDER and HERMAUNER. *Zur Kenntnis des Uteruskarzinoms* 1912

THEILHABER. *Ztschr f Krebsforschung* 1910 viii 473

WARD G G and FARRAR L K P. *J Am M Ass* 1925 lxxxv July 15

WARD G G. In discussion on uterine cancer. *Tr Sect Obst Gynec and Abd Surgery Am M Ass* 1924 p 244

A CLINICAL TYPE OF CHOLELITHIASIS RESEMBLING RENAL DISEASE

REPORT OF TWO CASES

By RUPERT S. CORBETT, I. R. C. S. (Eng.), LONDON, ENGLAND

From the Department of Surgery, University Hospital, Ann Arbor, Michigan

AND

CARLETON B. PEIRCE, A. B., M. D., ANN ARBOR, MICHIGAN

From the Department of Roentgenology, University Hospital, Ann Arbor, Michigan

THE two cases reported are of interest in that they presented a clinical picture suggestive of renal disease, but which after a complete examination, proved to be cases of cholelithiasis.

The diagnosis of gall bladder disease has always been a problem to the clinician. If the present day view of the etiology of gall stones is accepted, it follows that there is an infection conveyed by the blood stream to the gall bladder. This produces a cholecystitis, and as a result cholesterol is precipitated around the organisms or epithelial cells which have been shed, thus giving rise to the formation of stone.

Stone formation would then appear to be a result rather than a cause of cholecystitis. It must not be overlooked, however, that stones in a gall bladder are very apt to give rise to an exacerbation of this cholecystitis, which frequently may be very acute.

On the other hand, there is a group of observers who do not believe that infection is a necessary precursor of stone formation. In their opinion, a nucleus is formed from a chemical compound, in all probability cholesterol, or even possibly one of the bile salts. A parallel to this is seen in the formation of renal stone, which takes place only in those patients whose chemical metabolism tends easily to precipitation. Stasis of bile then becomes a very important associated factor, as does the relative concentration of cholesterol in a solution of bile salts.

Coincident with this view, the presence of a gall stone in the gall bladder can act as a foreign body and by its constant irritation, produce a cholecystitis. Thus, the stone becomes the cause rather than the effect. Based on this hypothesis, complete removal

of the gall bladder in all cases of cholelithiasis does not seem to be justified.

Gall stones give rise to varied symptoms and signs according to their position in the biliary tract. In this article, we wish to think only of their effect when present in the gall bladder.

It was originally thought that gall stones always give rise to biliary colic, usually followed by jaundice. In fact, the jaundice was considered an essential finding before a diagnosis was made. We know now that gall stones are not necessarily associated with jaundice, and furthermore, that the presence of jaundice is not of prime importance in the diagnosis of gall bladder disease.

Stones in the gall bladder may give rise to no symptoms which are severe enough to cause the patient to seek medical advice. If a careful history is taken, it is generally found that the patient has had symptoms of pain and discomfort referable to the stomach over a long period of time. There is not the periodicity associated with a gastric or duodenal ulcer and, although the discomfort is associated with food, it comes on almost immediately, or very shortly, after food is taken. There is generally the association of flatulence giving rise to a sense of fullness or distention in the epigastrium.

The factors bringing the patient to seek medical advice are: (1) the symptoms becoming gradually more severe, associated with a sense of weakness and a lack of ability to do their usual daily work; (2) the onset of a sudden attack of pain brought about by a recrudescence of the inflammatory condition in the gall bladder; or (3) recurrent attacks of colic, which may become so severe as to require the administration of

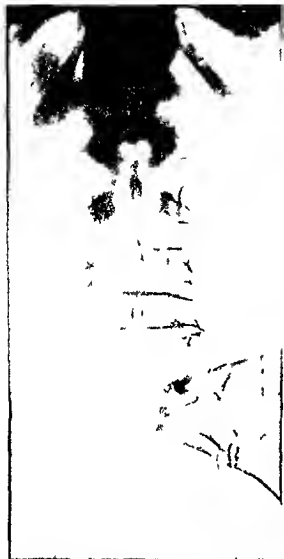


Fig. 1. Case 1. Preliminary plate showing ureteral catheter inserted on right side. Stones are demonstrated in the line of the catheter.



Fig. 2. Case 1. Pyelogram showing stones at junction of renal pelvis and ureter.

morphua. To the above classification we would suggest the addition of a group in which renal symptoms impel the patient to come to the physician.

The two cases to be reported illustrate this last group. This undoubtedly is a rare type but nevertheless exists as a definite entity.

It has been observed that a pyelitis is not an uncommon association with gall bladder disease. Whether the pyelitis leads to the cholecystitis or vice versa is not clear. We

do know that bacillus coli is the most common infective agent in the urinary tract. It is also the most common organism obtained from bile in cases of acute cholecystitis. Both conditions are more common in women than in men, and pyelitis more commonly affects the right kidney than the left. There are then these predisposing factors in common.

The renal symptoms predominated in these cases, yet the findings in the gall bladder appeared to be more advanced than those in

the urogenital tract. In addition to this the rapidity with which the urinary symptoms cleared up after operation was remarkable.

We consider that we are justified in concluding that the cholecystitis with the association of stones in the gall bladder was the real cause of the symptoms in each case.

Inspection of the literature does not reveal any reference to such cases as those described below. In textbooks, the only mention found of the association of pyelitis with cholelithiasis is made by Mayo-Robson, who states under a list of twenty seven complications of cholelithiasis "Pyelitis on the right side due to a gall stone ulcerating its way into, or an abscess of the gall bladder bursting into the pelvis of the kidney."

CASE 1. Mrs. C. J., age 52, housewife (125889), was first seen in the Medical Out Patient Department of the University Hospital on September 21, 1925. She was complaining of pain in the back extending down the legs associated with general weakness and the presence of blood in the urine. Pain in the back had been present for a number of years. Four or five days before admission, she noticed a burning and smarting sensation on urination. There was a frequency every few minutes but no incontinence. The passage of blood and clots was noted in the urine and a nocturia reported for 2 nights only. The patient had always been in fair health and had never had such an attack as this before. She had lived in Michigan for the past 35 years. There was no history of any serious illnesses. She had had a hemorrhoidectomy and some operation in the pelvis. There was no history of jaundice or typhoid fever. The menopause took place 3 or 4 years ago.

On examination the patient was of light build weighing 93 pounds. She had lost about 18 pounds in 31 years. The head, neck and thorax were negative. Deep palpation of the abdomen elicited some tenderness on the right side, and the liver edge was palpable on deep respiration. The kidney was palpable on the right side, but there was no marked tenderness in the costovertebral angle. Her reflexes were normal. Blood Wassermann negative. The urine at this time showed the following: pale in color, acid in reaction, specific gravity 1.013, and a cloud of albumin present. The centrifuged deposit showed epithelial cells, numerous red and white blood cells. The next day an examination in the Genito Urinary Department revealed a diffusely inflamed urinary bladder. Each ureter was catheterized and it was found that red blood cells, white blood cells, epithelial cells, and a few colonies of staphylococci were present in the specimens of urine obtained from both the left and right sides. Cultures were made from samples of urine from



Fig. 3 (left) Case 1. Detailed study of the gall bladder with oral administration of sodium tetraiodophenolphthalein.

Fig. 4 Case 1. Roentgenogram of gall stones following removal. The outer shell of one stone is seen lying to one side.

each ureter and showed growth of staphylococcus albus. Guinea pigs were inoculated.

Pyelograms were next made. The right pelvis appeared normal after injection of the opaque fluid, although the kidney was low in position. Opposite the tip of the transverse process of the fourth lumbar vertebra was a shadow suggesting a gall stone lying in very close relation to the kidney pelvis (Fig. 1). After the administration of tetraiodophenolphthalein, an elongated shadow opposite the transverse process of the third lumbar vertebra was demonstrated. It was faint and not indicative of a well filled gall bladder. In the middle of this shadow were seen several shadows resembling gall stones. The dye was given a second time 2 days later and a well defined shadow of the gall bladder was obtained in the center of which four faceted stones were clearly seen. This confirmed the diagnosis of cholelithiasis.

An operation was performed by Dr. Cahot on October 5, 1925. The gall bladder was of large size projecting 2 inches below the liver margin which itself projected $2\frac{1}{2}$ inches below the costal arch. The four stones were in the fundus of the gall bladder. The texture of its wall did not appear to be grossly diseased so, only the projecting part of the fundus with the stones was removed and the body of the gall bladder reformed by suture after ward.

The patient's convalescence was uneventful. Urine examinations at intervals during convalescence showed that the presence of red blood cells and white blood cells entirely disappeared. A culture on the day of discharge reports scant growth of Gram positive cocci mostly in pairs,—diplococci and staphylococcus albus.

The pathological report on the portion of the gall bladder removed states: "Chronic catarrhal cholecystitis with mucous gland metaplasia. Fibrosis of submucosa. Section of liver shows acute passive congestion. Diffuse fatty degenerative infiltration of the toxic type.—A. S. Warthin."

CASE 2. M. R., age 37, housewife (127899) was seen in the Surgery Out Patient Department of the University Hospital on October 13, 1925. She com-



Fig 5 (left) Case 2 Detailed study of gall bladder with tetraiodophenolphthalein demonstrating stones

Fig 6 Case 2 Roentgenogram of gall bladder following removal

plained of pain in the right side of the abdomen. The onset she attributed to an injury 25 years ago. From this time she had suffered a stinging pain starting in the right costovertebral region and

radiating downward and inward. Associated with this she had frequency—during the day 7 to 8 times at night 2 to 3 times. She also noticed haematoma at intervals. She was never jaundiced. At times the pain starting in the back was so severe that it doubled her up and was associated with nausea and vomiting. In the past history there was no evidence of typhoid fever. She stated however that she had never been really well. She had suffered from numerous minor ailments and from constipation all her life. She was a well nourished woman weighed 160 pounds. General examination was negative. Abdominal examination showed diffuse tenderness. There was spasm of the right rectus on deep palpation. A mass was felt in the region of the right kidney which was thought to be that viscus. It was tender and moved on respiration. The liver dullness was not enlarged. Reflexes were normal. The urine was straw colored alkaline in reaction specific gravity 1.020 no albumin. Centrifuge deposit showed a sediment of epithelial cells and a few pus cells. No red blood cells were seen. She was referred to the Gynecological Department. They reported examination of the pelvis as negative and suggested her condition might be urinary. The



Fig 7 Case 2 Preliminary plate showing ureteral catheters inserted on both sides. Stones demonstrated along twelfth rib



Fig 8 Case 2 Pyelogram showing normal pelvis of right kidney with the shadows of the gall stones lying well to the side of the renal pelvis

Genito Urinary Department reported a normal urinary bladder. Ureteral catheters were passed and a specimen of urine from each kidney was taken for examination. The right side showed a few white cells and epithelial cells. The left was similar. The pyelogram report stated "Right shows apparently normal pelvis. We note shadows of increased density which in this roentgenogram, lie along the twelfth rib. They are definitely separated from the kidney. We consider them to be gall stones." X-ray examination of the gall bladder after oral administration of tetraiodophenolphthalein demonstrated shadows very suggestive of gall stones (Fig 5). The stomach and duodenum appeared normal and the appendix was tender and segmented. A diagnosis of chronic cholecystitis and cholelithiasis was made.

Operation was performed by one of us on October 27, 1925. The gall bladder was found to be large containing four large faceted stones and was removed together with the stones. A biopsy was done on the liver and the appendix removed. The abdominal wound was closed without drainage.

The patient made an uneventful recovery. The urine report on discharge stated "no growth on culture," and there were no abnormal constituents. The Department of Pathology reported "Gall bladder—slight chronic cholecystitis. Appendix no active process, old fibrosis. Liver diffuse, fatty infiltration of toxic type."

In 1899, Carl Beck reported the first observation in a roentgenogram of biliary calculi. Since that time, the roentgenologist has been taxed to differentiate between biliary calculi, renal calculi, and calcified mesenteric nodes. The two cases reviewed here present a similar difficulty in diagnosis. They also permit us to answer, in a measure, a question which has arisen with the introduction of the tetraiodophenolphthalein in cholecystography by Graham, Cole and Copher. This question may be stated: Is the increased visibility of the bile stone due to an absorption of the dye by the stone or due to the background afforded by the bile containing the opaque salt?

In Case 1, the pyelograms (Figs 1 and 2), showed several rather round laminated shadows lying in the region of the kidney pelvis. When viewed in the stereoscope, these were definitely anterior to the renal shadow. Thus, they did not conform to the requirements laid down by Thomson Walker and Knox that renal calculi should be uniform in density, and be incorporated in the shadow of the injected kidney pelvis. One must then

consider biliary calculi, calcified mesenteric nodes, or possibly faecal masses of unusual density. The last would very rarely have such regular shape as was found. A detailed study with the administration of the tetraiodophenolphthalein was suggested by Dr P. M. Hickey. Following the ingestion of the opaque salt, a fluoroscopic examination showed that, although these shadows moved upon bimanual palpation of the kidney, they did not move with the kidney upon respiration. The kidney shadow moved downward and somewhat outward; the extra densities noted moved up and down in almost the same vertical plane. Detail films were then made of the gall bladder region with the Potter-Bucky diaphragm. These showed in the prone position a pyriform shadow with a markedly elongated neck dependent from the liver margin, and lying near the vertebral border. In the fundus, which lay opposite the transverse process of the third lumbar vertebra, were the shadows of four angular masses, concentrically laminated (Fig 3). In the supine position, these shadows were larger, and less sharply defined, indicating that they lay nearer the ventral surface. Further study in the lateral view, the patient lying supine, as advocated by Knox, demonstrated the same shadows just anterior to the vertebral bodies. Accordingly, a diagnosis of biliary calculi was made. An interesting observation of the examination was the character of the shadows of the calculi, particularly the zone of lessened radiopacity setting them off from the medium of the dye-filled viscus.

Following operation, the chemical characteristics of the stones were studied, and from this, the stones were determined to be in the class of the "combination stone" consisting of cholesterol, bile, and calcium salts. Their outer lamina, rather hard and polished, was about $\frac{3}{8}$ inches thick, and when dry, separated easily from the underlying structure. This apparently corresponded to the area of lessened density mentioned above for it was but slightly opaque to the roentgen ray (Fig 4). A thorough study by Dr Howard B. Lewis, professor of physiological chemistry, showed no trace of the tetraiodophenol

phthalein. This supports a growing belief in this clinic that the increased visibility of biliary calculi with the tetraiodophenol phthalein is not due to the absorption of this opaque salt by the stone but rather due to the background afforded by the opacity of the dye containing viscus.

In Case 2, a barium meal in the gastrointestinal series presented a normal appearance of the tract with the exception of slow emptying and tenderness of the appendix and the observation of some shadows in the gall bladder region which were suspected of being biliary calculi. There was no evidence of pressure upon the duodenum by a large gall bladder.

The tetraiodophenolphthalein was then administered by mouth and cholecystograms demonstrated an ovoid shadow quite large which lay opposite the third lumbar vertebra. Within this shadow were four areas of increased density similar in character to those described in the preceding case (Fig. 5). A diagnosis of biliary calculi was made by the Department of Roentgenology. A pyelogram made at the request of the Genito Urinary Surgery Clinic showed a normal pelvis of the right kidney with the shadows of the gall stones lying well to the side of the renal pelvis in soldier formation along the twelfth rib (Figs. 7 and 8). Following cholecystectomy the gall bladder was radiographed without opening and presented the appearance shown in Figure 6. Here we again note each calculus set off from the background of the shadow of the viscus by an area of increased radiolucency as in the preceding case.

It should be noted that in both of these cases there was demonstrated a fair shadow of the gall bladder indicating that the viscus was able to collect and concentrate the bile in an appreciable measure following its excretion by an apparently normal liver. This

would tend to make us consider that there was not a sufficient degree of cholecystitis to interfere with the normal concentrating function.

In both cases a biopsy of the liver was made the report of which has been noted above. This observation will be discussed at a later date in connection with the report of the experience of this clinic with the use of tetraiodophenolphthalein in cholecystography.

SUMMARY

The findings in these cases bring out certain points of interest:

1. There is a clinical type of cholelithiasis resembling renal disease.

2. Treatment of the cholelithiasis at once relieves the renal symptoms.

3. The finding of gall stones in the roentgenogram is enhanced by the use of the tetraiodophenolphthalein, not due to absorption by the stones but to the contrast afforded by the background of bile and opaque salt.

4. The cases were associated with (1) large gall stone formation, (2) a moderate degree of pathological change in the wall of the gall bladder and (3) a very fair shadow of the viscus after the oral administration of tetraiodophenolphthalein. This last is indicative of (1) normal liver function, (2) patency of the cystic duct, and (3) good power of bile concentration by the mucosa according to the standard of Graham and Cole.

These facts make it difficult for us to reconcile ourselves to the generally accepted view of the etiology of gall stones. They tend to the view of the chemical rather than the infective basis for gall stone formation. The gall stones might then be considered to be a cause rather than the effect of the cholecystitis.

We are indebted to Dr. Hugh Cabot and Dr. I. Weston M. Hickey for the publication of this report.

CHOLELITHIASIS IN THE NEGRO¹

BY EMILE BLOCH M D, F A C S, NEW ORLEANS, LOUISIANA

WHEN one considers the number of cases of biliary calculi seen and the percentage in the negro, he is astounded with the rarity of the condition. In my investigation of this subject, I was surprised at the scarcity of data, with only a mention as to statistics in textbooks. The most complete thesis with bibliography to be found on the negro race is in a paper presented by Professor Matas (12) to the American Surgical Association in 1896. His data are acquired from the records of Charity Hospital, New Orleans, Louisiana, for the years 1884-1894. At that time the rarity of appendicitis in the negro was most noticeable (total whites 25, 7 deaths, total colored 9, 2 deaths, 1884-1893), as was urinary calculi, 43 cases (1884-1894). Today appendicitis is not uncommon in the negro, but the infrequency of renal and biliary calculi still persists.

There seems to be a connection between infections of the gall bladder and the urinary tract, as referred to by Walton (32). A condition of greater infrequency is biliary calculi in the negro male. Having been associated on a colored male surgical service for many years, I have encountered only one case which my statistics will verify. This case is the second in eighteen and one half years at Charity Hospital, New Orleans, Louisiana.²

This comparison between whites and negroes is shown in a report of 106 cases of cholelithiasis operated upon at Louisville, only one was colored (Gould and Warren, 8). A routine postmortem examination at Johns Hopkins Hospital, Baltimore, showed the percentage incidence of gall stones among blacks as 5.5 against 7.9 among whites (Mosher, 16). From my clinical investigation these figures seem to be incorrect.³

A few statistical records in the white race for comparison may be cited. The frequency in the white female to the male is 3 or 4, to 1. In the white race, one in every 10 or 12 autopsies

shows gall stones, though only 10 per cent who have them show from marked symptoms (Barker, 4). European records show gall stones present, all ages and both sexes, in from 5 to 12 per cent, in Strasburg, 12 per cent, in Kiel, 5 per cent, in Manchester, 4.4 per cent, etc (Albutt and Rolleston, 1). These statistics are low as they were taken from the working class. In America, Mosher (17) found in 1,655 cases, 115 cases of gall stones, or 6.9 per cent. For a more complete statistical table, see article by Louis J. Mitchell of Chicago (15), with statistics from 1,600 necropsies, 50 of which showed calculi.

The following figures will be of interest in connection with this subject. Clark from the Canal Zone (negroes) reports a total of 1,088 necropsies, calculi in 24, 2.2 per cent. Of 37 female negro cases, calculi were found in 2. With his experience in the Canal Zone, he concluded that the West Indian negro is more liable to calculi than the same race in temperate climates.

A few other statistics may be of interest. Rogers believes that in Calcutta biliary calculi are more common than in some European climates. Mohammedans are slightly less liable than Hindus, and Europeans considerably more so. Robson and Cammidge refer to Morehead's practice in India, reporting only four cases. Ruzf did not see a single case in Martinique and Borchgrevink had the same experience in Madagascar. Primer Bey claims that in Egypt calculi are more common in Europeans and Turks than in natives and negroes. Jeffrey's and Maxwell's records show one case in Shanghai, though urinary calculi are common.

In Charity Hospital, New Orleans, Louisiana, from January 1, 1906, to June 30, 1925, 18½ years the total of primary cases of biliary calculi was 196 (white and negro) or 0.166 per cent. The operative cases in that time were 117.841 (minor surgery excluded).⁴

¹Record from dates from January 1906.

²A comparison of autopsy records from Charity Hospital New Orleans Louisiana is unavailable.

³These figures represent the working class which is less liable to gall stones.

⁴From the Department of Surgery Tulane University School of Medicine.

In Touro Infirmary, New Orleans Louisiana (indoor service exclusively white), from October 1, 1921, to June 1, 1925, 334 years are recorded primary cases of cholelithiasis, 40, secondary 59, 0.54 per cent, total major and minor operations 18,171 (treatment room cases included). Of 196 cases in Charity Hospital, 17 were in negroes—15 female 2 male Flint Goodridge Hospital, New Orleans Louisiana (negro hospital), from January 1 1916 to June 1 1925 9½ years reports 6 cases of biliary calculi, 0.187 per cent—4 female and 2 male Total operations 3 703

The 1920 issue of the United States Mortality Statistics (31) shows calculi in whites male 733 female 2 185 negroes male 28 female 77 The latest mortality report 1922 shows calculi in whites male 891, female 2 569, negroes male 31 female 78

The first colored male case of cholelithiasis recorded at Charity Hospital New Orleans Louisiana was by Dr Hermann Gessner March 16 1918 with an operative diagnosis of subacute obstructive cholecystitis with cholelithiasis History written by interne Dr Howell

CASE 1 A N admitted March 16 1918 discharged April 6 1918 He complained of stomach trouble which began 6 months ago with pain in abdomen after eating becoming more severe one hour afterward Trouble continued for a period of 2 to 3 weeks then he felt absolutely well until 2 months ago With the attacks he vomited blood The pains were of a burning character sharp and were accompanied by belching and later by vomiting The past and family history is negative X ray and clinical diagnosis made March 10 1918 was possible gastric ulcer X ray examination showed irregularity in filling of stomach near the pylorus no 6 hour stagnation (J W Harney M D)

Examination of gastric contents March 22 1918 showed motility no raisins or seeds returned free hydrochloric acid 38 per cent total hydrochloric acid 55 per cent trace of occult blood no lactic or butyric acid Microscopical examination showed a few red blood cells Cholecystectomy was done through a transverse incision of abdominal wall March 31 1918 Ether was used The suture line ruptured and was resutured by Dr Jerome Landry Pathological report chronic infiltrative and proliferative cholecystitis

CASE 2 Joe Jones aged 51 (Serial No 110993) male colored admitted June 8 1925 discharged July 16 1925 History was written by Dr J E Snelling Patient complained of pain in lower

right side of abdomen and in right shoulder at intervals About 4 years ago he was taken with a severe pain in right side of abdomen cramp like in character which radiated over the lower part also a sharp pain which radiated to the right shoulder Nausea and vomiting were present at this time This attack passed away in a day Since that time he has had recurrent attacks of similar character but these attacks have not been so severe and have not been accompanied by vomiting Patient says that at times he has noticed that bowel movements were colored like putty He has never noticed any blood or mucus in stools has never had a diarrhoea of significant duration

Patient had measles at 7 mump at 8 typhoid fever at 14 years He was in bed 60 days with fever He had pneumonia with typhoid (?) a broken clavicle at one and one half years urethritis at 30 years sore on penis in 1924 The family history was irrelevant Physical examination showed the patient to be a well developed and well nourished colored male not acutely ill No gross deformities were noted The conjunctiva was discolored The teeth and tonsils were negative The neck was negative The thorax was symmetrical the lungs clear of adventitious signs and sounds The heart was not enlarged and there were no murmurs The abdomen was negative save for pain on pressure in the right iliac region no palpable masses were present and no ascites The extremities were negative the glands negative the reflexes normal Examination of urine June 10 1925 was negative June 17 negative Blood count June 11 1925 showed total white cells 8,500 small mononuclears 20 large mononuclears 4 neutrophils 76 June 17 1925 total white 5,000 small mononuclears 15 large mononuclears 5 neutrophils 85 no malaria plasmodia Wassermann negative

Operation was performed June 12 1925 under ether anesthesia Tentative diagnosis chronic appendicitis An appendectomy and cholecystectomy were done The appendix was found meshed in many adhesions and bound down The gall bladder showed a stone the size of a small almond and many small sand like particles (calcium bilirubinate stone)

Progress notes June 13 1925 temperature 102 He feels very well except for pain in the epigastrium which was relieved by allowing the tube to drain (tube cut off at intervals) June 14 1925 temperature 100 pulse rapid (103) regular good volume Since operation 8 ounces of thick syrupy bile has drained from catheter No abdominal distention is present Course sibilant and sonorous rales are heard over both lungs (bronchitis) June 15 1925 temperature 101 general condition fair pulse 116 20 There were same physical findings as yesterday wound was dressed and no pus is found in the incision but there is a slight infection around the drainage tube June 17 1925 temperature maximum 102 pulse 102 82 no change in wound free drainage of bile which now is clear and of a

golden yellow color opposed to the thick green bile that drained the first few days. The possibility of typhoid fever was discussed. June 18, 1925, temperature 100, patient feels better. No other comments were made in morning. In afternoon Pezzar catheter was removed. About 1½ pints of bile has drained since operation. The retention sutures were removed and the wound cleansed thoroughly. A gauze drain was placed in tract of the catheter. June 19, 1925. Blood culture for typhoid was taken. temperature 99. Bile drained from biliary fistula. Afternoon temperature was 98.6. June 20, 1925. temperature maximum, 100. the general condition was good, the fistula was still draining. June 21, 1925, temperature maximum, 100, patient feels well. bronchitis has cleared up, the biliary fistula is draining freely. June 22 1925, patient's general condition is good, temperature 99.6, drainage same. June 23, 1925 blood culture is negative for typhoid, bacillus staphylococcus albus found, probably a contamination. The operative wound has healed completely. the stab wound only slightly. Bile is still draining. Temperature 100. June 26, 1925, the biliary fistula is healing rapidly. June 30, 1925, the wound is closing nicely. There is slight drainage of biliary fluid.

Postoperative examination shows blood cholesterol, 303 milligrams per 100 cubic centimeters and bilirubin (van den Bergh) indirect 5 direct, negative (Drs D N Silverman and T A Tumbleson.)

Examination of the stone was not complete because after the stone had been crushed for culture the sand was misplaced and a chemical analysis was thus made impossible. The calculus measured 1.5 by 1 centimeter. had a slightly roughened surface, was dark pearly gray in color and of a light weight in proportion to its size, weighing only 1.2 grams. It was brittle on the outer surface and was easily crushed to a powderlike form. It was ash like in color throughout with a ring of black about midway of the thickness of the wall. Grossly this places the calculus as a mixed bilirubin calcium calculus having at least 25 per cent cholesterol with probably traces of copper and iron. Culture of inner material was sterile. (Dr M P Bowden.)

In considering the etiology of gall stones we will again make reference to the treatise on the negro by Professor Matas, which refers to statements which are to this date of fundamental importance. We refer to the illustrious Quatrefages (a French naturalist, 1810-1892,20) who submits the following propositions as guiding axioms.

- 1 The essential or fundamental nature (biologically speaking) of all men is the same.
- 2 The formation of distinct races has been the sole cause of modifications in this fundamental nature of all human groups.

3 The several characters and special aptitudes which constitute a kind of acquired nature have in each of the groups, been developed under the influence of varying conditions of existence. That is when the disturbing action, as the cause of disease or injury, acts upon the fundamental element, the same cause will produce fundamentally the same effect, on the contrary, when this action is exercised upon the acquired element of each race, the same cause will produce different effects. This may be better expressed "Unity of species and multiplicity of races involve the liability of all men to common diseases, which will at the most vary as to accessory phenomena, but allow the existence of disease more or less peculiar to certain human groups."

The negro has many diseases in common with the white race, but the absence of calculi biliary and renal,¹ seems characteristic of their group. Before going into the etiology of biliary calculi, it is important that we have an insight into the physiological chemistry of the bile and blood with their relation to each other and to food, and to the formation of biliary calculi in the white race. As to this type of experimental work on negroes, I can find no data, therefore no comparative statistics exist. The first constituent of the blood and bile that we will discuss is cholesterol, as this is the most frequent constituent of calculi.

CHOLESTEROL

Cholesterol (Campbell, 5) was first isolated by Conradi in 1775 and analyzed by Chevreul in 1815. Its physiological and pathological significance was recognized after the beginning of the present century. In 1862 Flint tried to show its presence in the blood, and soon afterward Pecot demonstrated the amount of increase in a grave case of jaundice. In 1909, Windaus introduced a method of estimating cholesterol. The amount was found to be increased in diabetes by Fischer, and diminished in chlorosis by Erben, Panzar, and Aschoff. Other names that should be mentioned in this work are Craven Moore, Doree, and Gardner.

¹ Renal calculi are rare in the colored race as shown in the records of Charity Hospital New Orleans.

Formerly the origin of cholesterol was based on the theory of Naunyn and Jankau, i. e. cholesterol of the bile is not the result of metabolism and is not a specific secretion of the liver but is formed from the mucous lining of the gall bladder and large bile ducts especially when inflamed, as a result of bacterial infection. This theory has been found to be incorrect as will be brought forth in considering the chemistry.

Cholesterol is composed of $C_{27}H_{48}O$ (contains an alcoholic hydroxyl group), it belongs to the class of terpenes which occur widely distributed in the vegetable world and which had previously not been recognized as existing in the animal world. The animal organism, therefore, contains hydro aromatic compounds. It combines with fatty acids to form compound esters which are analogous to the fats. In this form cholesterol exists in the animal world (Robertson 23).

The proportion of cholesterol in bile varies from 20 to 80 milligrams per 100 cubic centimeters, and the proportion in blood varies from 150 to 180 milligrams per 100 cubic centimeters. It cannot be said definitely that cholesterol is derived from the diet but the evidence points in that direction. Cholesterol is found in all animal fats and oils, sheaths of nerve fibers, liver, kidney and suprarenals. Also it is found in considerable amount in cod liver oil. It may be held in solution or suspended in emulsified form in water by the addition of soaps, saponins, bile salts or lecithin. It is by this means that it is held in solution or suspended in the bile and other tissue fluids. Cholesterol administered by mouth results in its absorption as shown by direct observation by Knudson by means of cholesterol in the blood by deposits of cholesterol which are formed in the tissues and by the effect of growth of animals. Cholesterol itself is not found in the vegetable kingdom but the isometric phyosterols (Robertson 23) such as sitosterol are found in wheat, rye, linseed oil and calabar bean. They increase the cholesterol in the blood. Also neutral fats as olive oil increase the cholesterol in the blood. In certain disease conditions in which there is much fat in the blood (lipæmia), the choles-

terol is increased. On reaching the liver in a quantity in excess of that which should normally be present in the blood stream cholesterol is taken up and excreted by the liver cells and furnishes an important constituent of the bile. The latter on reaching the intestinal tract forms an additional source to the food supply from which the cholesterol is also absorbed in the blood. Its functions are unknown but its reabsorption suggests that like the bile salts, it is some help in fat absorption (J. C. Campbell).

The conclusions derived from the previous data and cited by Wilensky are as follows:

- 1 Cholesterol content of blood in various animals and in different human races depends upon the cholesterol (lipoid) content of the food.

- 2 Cholesterol content of bile depends on cholesterol content of the blood.

- 3 Marked increase of cholesterol in blood will cause a marked increase in the bile cholesterol and vice versa.

Other conditions that alter the cholesterol content of the blood are as follows:

- 1 Cholesterol is lowered in fevers (infectious), anæmia, malignant diseases, acute yellow atrophy, and tuberculosis.

- 2 Cholesterol is increased (a) in the presence of other disease conditions as arterio-sclerosis, diabetes, and nephritis, (b) during pregnancy and in the postpartum period, (c) in complete obstruction of the common bile duct (increase 0.25 to 0.7 per cent), if there is no complete obstruction, hypercholesterolemia may not appear.

Rothschild and Wilensky (26) have summarized the gall bladder conditions in which the cholesterol content of the blood can be normal.

- 1 The cholesterol content of the blood can be normal in the presence of stones, in normal gall bladder, without common duct obstruction, with or without high temperature.

- 2 In chronic inflamed gall bladder containing stones, without common duct obstruction and with or without high temperature.

- 3 In the presence of any of these conditions with incomplete obstruction of common bile duct.

4 In presence of empyema of the gall bladder with or without stones, with or without fever and with no obstruction of common bile duct

5 In conditions as in division 4 with partial or complete obstruction of common bile duct The occurrence of hypercholesterolæmia has significance in only one instance, and that is to differentiate jaundice due to cirrhosis of liver and common duct obstruction, i.e. cirrhotic conditions gave a low cholesterol content of blood

SUMMARY

"The diagnostic value of cholesterol estimation in blood, in any given case, is variable and dubious" The cholesterol content of bile and blood can be influenced by dietary means as claimed by Doree, Ellis, Fraser and Gardner, and conclusive proof is given by Pribram, Fraser and Gardner, Gregaut and L. Huilleir, Autschkow, and Chalataw, Waskee, Weltman and Beach, and Rothschild (Table I)

TABLE I—CHOLESTEROL READINGS IN VARIOUS DISEASE CONDITIONS—RECORDS OF D. N. SILVERMAN AND EMILE BLOCH, NEW ORLEANS

	Amount in Mg
1 Chronic pancreatitis achylia, white stools no jaundice (white)	30
2 Chronic appendicitis (acute exacerbation) cholecystogram negative (white)	38, 6
3 Gall bladder infection with distortion of gall bladder in cholecystogram with 7 day retention of dye (white)	277 7
4 Cholecystitis (colored woman)	192 3
5 Cholecystitis Cholecystostomy one year previous for sepsis (white)	265 95
6 Cholelithiasis No jaundice at time of blood examination (colored male)	303
7 Cholelithiasis (cholesterina) cholecystostomy 8 years previous (white) before second operation	252
Not dieted During attack (3 cholesterol stones at second operation)	774 7
8 Duodenal ulcer (white)	200
9 Chronic biliary infection No jaundice (white)	238 4
10 Cholelithiasis No jaundice (white)	3 6
11 Chronic biliary infection following influenza Jaundice (white)	312 5
12 Chronic biliary infection Achylia fatty stools No jaundice, December 9 1914 (white) February 6 1915 following fat free diet	306 7 264 5
13 Chronic biliary infection Cholecystostomy previously performed No jaundice (white)	04 9

	Amount in Mg
14 Chronic biliary infection following influenza (white)	00
15 Chronic cholecystitis No jaundice (white)	263 10
16 Chronic cholecystitis No jaundice (white)	243 9
17 Chronic cholecystitis and migraine (white)	238
18 Chronic cholecystitis following amoebic dysentery 4 years duration (white)	2 4 4
19 Chronic cholecystitis No jaundice (white)	231 4
20 Duodenal ulcer 6 hour gastric retention (white)	280 9
21 Chronic cholecystitis with pus in gall bladder Achylia and pancreatic diarrhoea (white)	217 7
22 Subacute biliary infection with cholecystitis following influenza No jaundice (white)	19- 3
23 Cholecystostomy 2 years previous Later a cholecystectomy (white) Reading before second operation	277
24 Chronic cholecystitis with cystic duct obstruction (white) After operation	244 4 238
5 Chronic cholecystitis Definite shadow of gall bladder with ordinary radiogram (white male)	77 "
6 Chronic cholecystitis with papilloma of gall bladder No jaundice (white) Before operation	233 6
27 Cholecystitis Increasing symptoms with pregnancy Cholesterina crystals in bile (white)	263 1
8 Chronic biliary infection No jaundice April 28 1925 Large liver Typhoid 25 years previous (white)	335 8 167
9 Colitis several years then biliary tract infection with jaundice No bile in duodenum for 7 days (white)	268
30 Carcinoma gastric and hepatic (colored male) Pre-operative reading	238
31 Acute appendicitis (colored male) Pre-operative reading	226

BILIRUBIN AND ITS PRECIPITATION

Another constituent of the bile that should be considered is the coloring matter of bile, known as bilirubin and biliverdin. These are intermediary products between blood pigment and the coloring matter of the urine (urobilin). Bilirubin can be converted into biliverdin by passing through the stages of biliprasin and bilifuscin. Biliverdin has a different spectrum from bilirubin. The amount of bilirubin in the blood is from 0.2 to 0.6 units or 1 to 3 milligrams per liter (1 unit equals 5 milligrams of bilirubin in 1 liter of blood) according to van den Bergh. The origin of bile pigment has been discussed very much within the past 3 years and its importance is increased in this connection with calculi formation in the negro, as calculi when present are as a rule of the calcium

TABLE II—CHOLESTEROL ESTIMATIONS DURING PREGNANCY BY WALTER LEVY, OBSTETRIC SERVICE, TOURO INFIRMARY, NEW ORLEANS

White				Colored			
C s	Date	Read g Mg	Multi p	C s	Date	Read g Mg	Multi p
S	7 5 5	4	M	P J	8 24 5	10	P
S	9 5 5	200	F	M H	7 1 35	10	M
H	7 15 25	120	P	R T	7 5 5	114 5	M
B	7 24 5	34	P	M M	8 5 5	6	I
B	8 3 25	26	M	H T	8 12 25	184	M
L	7 5 25		P	L B	7 6 25	160	I
L	7 3 5	60	P	(C)	8 4 5	356	M
L	9 3 3	143	P	V B	8 7 5	140 8	M
M	8 4 5	70	P	H G	8 31 25	5 4	F
R	8 11 5	14 8	M	(C)	8 0 3	16	M
S	7 4 25	128	M	O J	7 0 3	133 8	M
				R L	8 10 5	5 6	M
				O N	7 3 5	19	M
				I S	7 3 5	168	
					7 0 2	7	M

Th bo f m t be abo 1 th me in both es All
estimat us wer made a th l ite months of p gn cy

bilirubinate type G H Whipple (33) claimed that body cells other than those of the liver have the capacity of rapidly changing hæmoglobin into bile pigment. This was followed by experimental work by Mann Bollman and Magrath (11) in collaboration showing the formation of bile pigment after removal of the liver. Further experimental work was by Rich (22) of Johns Hopkins showing the extrabepatic formation of bile pigment. The most recent work on this subject as stated by Dr William Mayo, is by Sheard of the Mayo Foundation whose experimental work is by the spectrophotometric method. He concludes that bile pigment is not formed by the liver, but is carried to it (29). Other theories on the origin of bile pigment can be found in an editorial in the Journal of the American Medical Association (10).

LIVER FUNCTION TESTS

The different tests that are in use today to determine the liver function are the van den Bergh, Fouchet, Rowntree, Rosenthal dye test, the icterus index and the Widal hæmoclastic test. The van den Bergh test has a distinct value in studying liver function but the extent must be determined by the icterus

TABLE III BILIRUBIN ESTIMATION—VAN DEN BERGH METHOD BY T A TUMBLESON

C colo ed W whi M m le F fem I		D ease C lit n		Expressed Ind rect		1 Direct Delayed	
1	2	3	4	5	6	7	8
1	Carcinoma of liver (C M)						
2	Carcinoma of head of pancreas (W M) Gastrocholecystostomy			4		7	Delayed
3	Chronic cholecystitis (C M) Clinical diagnosis			2			
4	Impyema of gall bladder (C M) Operative diagnosis			1 6		2 5	Delayed
5	Obstructive jaundice (C M) Clinical diagnosis			12		21	Delayed
6	Chronic cholecystitis with cholelithiasis (W F)			1 2			Delayed
7	Cholecystitis (C F)			2		1	Delayed
8	Fernicus anemia (W M)			2 5			Delayed
9	Cholecystitis with cholelithiasis (W I)			1 6			Delayed
10	Cholecystitis with cholelithiasis (W M)			5 7		10	Biphasic
11	Septic jaundice (C M)			6		4	Delayed
12	Carcinoma of liver (W M)			6		8	Biphasic
13	Carcinoma of stomach (W M)						Normal
14	Carcinoma of stomach (W M)						Normal
15	Chronic appendicitis (W M) boy jaundiced			7			Delayed
16	Cumma of liver (C M)						Normal
17	Biliary colic (W M)			1 5			Immediate
18	Chronic cholecystitis (tor sion of cystic duct)			8			Negative

11 rem nd k emell (e) fou d w th 11 w m th od an increase

h l r u b i n a n d p g t w m n s i r o n e e r i n f i r s t m o t h d w m

w t h p e r c i o s o m i n g h t i h g h r o c t r a t o n o f b i l i r u b i n

index or dye test. It helps as a specific qualitative test for bile pigment to control readings of the icterus index in the zone of latent jaundice. It distinguishes between hemolytic and obstructive jaundice. The Fouchet test is unreliable for detecting minor grades of bilirubinæmia. The icterus index is a measure of the bilirubin in the blood; its clinical value depends on all the factors that will produce this condition and is an aid in diagnosis, prognosis, and treatment. It is simple, accurate, and of definite clinical value. In a recent article by Rydén (21), the value of the van den Bergh test is cited in different disease conditions of the biliary system. blood dyscrasias and occlusion of the common bile duct with strong immediate reaction obtained. Nine chronic cholecystitis cases gave negative direct and indirect value above normal in only one. 11 calculous cholecystitis cases gave a negative or delayed direct and an indirect reading of from 0.2 to 1.9 units.

PRECIPITATION OF BILIRUBIN

As to the precipitation of bilirubin, many theories have been expounded for many years. Bilirubin itself is never precipitated, but under certain conditions forms a combination with calcium and is then precipitated as an insoluble compound. It may be the nucleus of a stone or be the calculus itself forming the biliary sand. The question is what determines these formations. No matter in what proportion they exist in the bile, they cannot combine to form an insoluble compound. The addition of lime water would precipitate the combination if it were not that the bile salts hinder it by the bile acids combining with the lime. Thereby hinders the origin of the calcium that enters into the formation of calculi. Lime in the drinking water has no effect on lime in the bile (Naunyn). Its source in all probability is from the mucous membrane of the bile passages. Frerichs and others claim it is from an inflammatory exudate. Lichwitz doubts the formation of carbonates from exudates and Bachmeister has shown that small amounts of calcium carbonate fall out of bile *in vitro*, though not enough to account for carbonate stones. Naunyn believed that albumin was the chief factor in determining the precipitate of these concretions and the albuminous material is derived from the desquamation and disintegration of the epithelium of the bile passages.

The precipitation of bilirubin in insoluble form plays an important part in the formation of calculi as they act as foreign bodies causing secondary inflammation and acting as nuclei for many stones. A Bachmeister (3) has found calcium bilirubinate stones in uninfamed and sterile gall bladders but claims that they are more common in infected and damaged organs.

Comparison (Opparia, 19) of cholesterol and bilirubin contents of blood. (1) In obstructive jaundice and in some diseases of the parenchyma both are retained but they do not always run parallel. Cholesterol retention may last for weeks after the bile pigment has disappeared. (2) In nephritis and arteriosclerosis cholesterol is retained and bilirubin remains unchanged. (3) In cardiac

disease without arteriosclerosis, bilirubin is increased and cholesterol remains normal.

Chauffard claimed that because of the high cholesterol content in blood during pregnancy, stones were formed and also that a high cholesterol content of blood was diagnostic of stones. This was confirmed by Flandin, working with Chauffard's cases, and also by Heuer, Rothschild and Rosenthal, 1923, J. R. Bell, A. O. Wilensky and M. A. Rothschild, 1924. This idea was denied by Denis, Gorham and Meyer, Reimann, Meignow and Schnohel and further proved by Meyer and Campbell (5), showing that the high values were due to jaundice. Sir Berkeley Moynihan referring to the work of Dr. Cecilia Shuskin also claims a hypercholesterolemia in cases of gall stones but Campbell states that they do not specify whether these patients were jaundiced at the time of examination.

As for the increase during pregnancy it may be an etiological factor, but it does not last long enough to be of any diagnostic value and as to the retention in obstructive jaundice and other liver conditions, it is a secondary, accidental result and throws no light on the normal function of cholesterol.

EXPERIMENTAL WORK ON GALL STONE FORMATION

Reviewing the literature we find that much has been done with the result that there are many hypotheses but no conclusive proof. The work of Naunyn, confirmed by Harlev and Barrett, showed that the introduction of foreign bodies in the absence of catarrh did not produce calculi. In an article by Rothschild and Wilensky (26) many facts are considered. Their idea is best explained by quoting from their text: "Bile is a colloidal solution and cholesterol is held in suspension by means of bile salts, acids, and lecithin dissolved in it. Such a compound mixture is subject to the ordinary physical and chemical laws. Precipitation may occur following supersaturation or a disturbance of normal equilibrium. Infection causes an inflammatory response of the gall bladder wall with its exudates of electro-positive serum albumin and causes a precipitation of the ingredients

TABLE IV—CHOLESTEROL AND BILIRUBIN ESTIMATION BY D N SILVERMAN AND T A TUMBLESON

No		Estimation	Cholesterol (Mg)	Bilirubin (van der Beek) Units	
				D rect	Ind rect
1	J J (C M) Cholelithiasis	Postoperative	303	Negative	5
2	C P (C M) Appendicitis	Pre-operative	26	Normal	
3	M (W M) Cholelithiasis	Pre-operative	126.3	Normal	
4	C (W F) Cholecystectomy for esophageal varicose	Not operated upon	123.5	Normal	0
5	J (W F) Cholelithiasis	Not operated upon	220	Negative	0
6	W (W F) Cholelithiasis	Not operated upon	238	Normal	
7	S (W M) Cholelithiasis	Pre-operative	247.5	Delayed	7
8	G (W F) Cholelithiasis	Pre-operative	232.2	Normal	
9	M (W M) Subacute cholecystitis	Not operated upon	250.4	Negative	1.5
10	P (W F) Chronic hepatitis	Non-operative	234	Normal	
11	S (W M) Chronic gastritis	Non-operative	201.5	Normal	
12	W B (W M) Cholelithiasis	Not operated upon	303	Negative	7
13	R (W M) Cholelithiasis	Pre-operative	166.6	Negative	6
14	H (W M) Cholelithiasis	Not operated upon	243	Normal	
15	F (W F) Cholelithiasis	Non-operative	185	Normal	
16	P (W M) Cholelithiasis	Non-operative	18	Negative	6
17	H (W F) Cholelithiasis	Not operated upon	1	Normal	
18	McB (W F) Cholelithiasis	Non-operative	27	Normal	
19	K (W F) Acute cholangitis and edema	Non-operative	406	1.5	15
20	P (W F) Cholelithiasis	Non-operative	1.5	Delayed	8
21	S (W M) Gallstones	Pre-operative	201.3	Delayed	1.5
22	K (W M) Cholelithiasis	Not operated upon	6-15 15 335 33	Bilirubin 1.5	6
		After treatment 7.5	6-15 15 330	Bilirubin 1.5	1.5
23	M (W M) Chronic cholecystitis	Not operated upon	277.7	Normal	
24	S (W M) Myocarditis	Tetraphosphoric acid	204.1	Delayed	1.5

C colored W white M male F female

in an electro negative solution. This was demonstrated on a patient with a cholecystostomy and corroborated by experiments on rabbits by Anitschow and Chalataw (deposits of cholesterol stones).

Also in this connection may be mentioned the work of Michand (14) who showed that fats and cholesterol are held in an emulsion by the soap and cholates which diminish surface tension as emulsion colloids. Changes in these colloids by an excess of albumin, fats, or bacterial toxins may cause abrupt

precipitation and stone formation from bile mixture of crystalloids and colloids. He also describes the result of inflammatory production from colon or typhoid bacillus of fibrin and albumin which increase the calcium and lead to precipitation.

The etiological factors have changed from the idea of stagnation of bile, production of hypercholesterolemia, infection to a combination of infection and disturbed metabolism. As to stagnation the reader is referred to many of the disposing causes (occu-

pation, etc.) and secondarily to infection (cholecystitis)

On the subject of hypercholesterolaemia, a great portion of the experimental work is hinged. In reviewing this, you may refer to the experimental work on cholesterol in the blood and bile. It is difficult to produce a hypercholesterolaemia in a dog, and Rothschild and Wilensky claim, "all experiments on dogs in which a biliary fistula has been established are practically valueless." Nevertheless, Rothschild showed that in dogs with occlusion of the common bile duct cholesterol in the food was poorly absorbed but that it was more easily absorbed when mixed with bile.

The conclusion of Weltman and Beach as quoted by Rothschild, in regard to a difference in principle of cholesterol metabolism of herbivora and carnivora, was shown to be unwarranted inasmuch as the difference is only one of degree of activity of the liver as a filter. In humans, who are omnivorous animals, the cholesterol contents of the blood and bile are comparatively high. The actual content varies in different races, and the difference corresponds to the difference in the diet of the people.

DeLange (7) in observations among the natives of Java, China, Japan, and India, found that the cholesterol content averaged 40 to 50 per cent less than that in Europeans. These races can be classed as herbivora in contradistinction to the Europeans who have omnivorous dietary habits. Gall stones are frequently encountered and produced in animals, but only under conditions of infection and biliary disturbance. The most successful attempts were carried out on herbivora (rabbits and guinea pigs). Gilbert, Gilbert and Fournier, and Mignot, caused cholelithiasis in dogs by infecting the gall bladder with organisms of low virulence and hindering the evacuation of bile.

The experiments of Rous, McMaster, Drury, and Kietz, show that stones can be formed in the absence of infection, stasis and gall-bladder activity. The work of Rous et al (27), showed experimentally that the stones were always in the glass or rubber tubing and never in the biliary system, and in com-

position, the stones were one of three types (1) calcium bilirubinate, (2) calcium carbonate, or (3) a combination of both. Carbonates were found in stones from every animal. No phosphates were found and cholesterol was also absent. Nuclei were found in stones of all sorts but especially in such as contained much bilirubinate.¹

Aschoff and Bachmeister report occurrence of stones, of special type, in the uninfamed human gall bladder, and state that they are due to a disturbance in the general metabolism.

The experimental work on the infectious theory (Campbell, 5) of cholelithiasis dates from Bernheim in 1880, and Gallup in 1886, the former calling attention to typhoid fever and infection of the biliary passages. Other pioneers were Welch, in 1890, finding colon bacilli and staphylococci in the gall bladder, Chiari, in 1893, demonstrating typhoid bacilli, Gilbert and Dominici, in 1891, finding bacillus coli in 23 out of 73 cases and showing that bacillus coli and bacillus typhosus could cause cholecystitis and cholelithiasis, Mignot, who produced cholelithiasis in lower animals by use of bacillus coli, bacillus typhosus, bacillus subtilis, staphylococci, and streptococci, Milian and Harnot, 1896, who found bacillus typhosus in the center of a stone, and Cushing, Halsted, and Richardson, who showed the connection between typhoid fever and gall stone formation. The contribution of Rosenow (25) on the bacteriology of gall stones and the production of cholecystitis by the injection of selective streptococci is of much interest (Canine experiments).²

SUMMARY OF CHOLELITHIASIS IN GENERAL

There is no doubt that infection is the foremost factor that tends to disturb the normal proportion of bile ingredients, thereby causing calculi. Intermittent stasis, caused by inflammatory stricture or by infection of a previously formed stone, has also an

¹Large stones of calcium bilirubinate occur in oxen while in humans they are small.

²Certain hypocholones (F. C. Mann) having a special affinity for the gall bladder, if given intravenously, cause an inflammation and round cell infiltration in a brief period of time but this has no relation to cholesterol stone formation. Another differential point is that calcium is found with cholesterol stones.

important influence. The question, however, of the role that hypercholesterolemia plays, is doubtful. There is a relationship between the cholesterol in the food, bile and blood, and the hypercholesterolemia, with the anatomical derangement during pregnancy is a predisposing factor. No conclusive evidence exists to explain that stones are formed by an increase in cholesterol in the blood or bile, though estimations have been made on cases of cholecystitis and cholelithiasis. Therefore blood cholesterol estimations are of no diagnostic value. Experimentally stones have been produced in lower animals, especially in rabbits (Anitschow and Chalotow) and bacteriologically (Rosenow). The experiments of Rous, McMaster and Drury showed the composition of the stones were either calcium carbonate, calcium bilirubinate or a combination of the two with no cholesterol present. They conclude that individual difference in the character of the bile must sometimes have determined the occurrence of calculi, that the combined factors are the true cause seems to be most probable. We quote from an article by Sir Berkley Moynihan: 'The process of calculi formation is due to a mild infection causing a deranged organ that cannot secrete nor empty itself; then a milder sepsis plus metabolic changes in the bile completes the process.' Dr Charles H. Mayo (13) concludes: (a) cholecystitis is now considered a primary disease and the presence of gall stones secondary, (b) the relationship of hepatic function must be considered; therefore this must be looked upon as a group disease, (c) gall stones are found in 70 per cent of all cases of gall bladder pathology and the other pathological gall bladders form the other 30 per cent.

Gall stone cases that are jaundiced show a high blood cholesterol. This fact is of no diagnostic value other than as a postoperative guide as to diet (prevention of recurrence of calculi in a damaged organ).

From Chiary and his co-workers we have a conclusion based on 37 observations. In healthy subjects the amount of soluble cholesterol in bile was not modified in visceral diseases without changes of the liver and not even in affections of the gall bladder except

cholelithiasis. The usual decrease of soluble cholesterol in the bile was not always present with gall stones. This fact may be explained by the two phases of the disease: the stage of formation of the stone and the stage of mechanical and infectious complications, etc.

BILIARY CALCULI IN NEGROES

Having reviewed as much data in the white race as is available to show what conclusions have been derived, I should like to discuss the negro. This race has been in the new world 420 years (1505), according to Las Casas Spanish History. Just as in the white race there seems to be a relationship between food, blood, and bile. Though the food may be of the herbivorous type, there seems to be some other protecting factor. DeLange refers to the rarity of gall stones in the colored race and speaks of this condition being noticed by the early English physicians.

As to the type of stone encountered, I am of the same opinion as my predecessors, that the stones are of the calcium bilirubinate type. The rarity of calculi in the negro, the difficulty of forming calculi in the dog, the type of stone (calcium bilirubinate experimentally produced in dogs and the stones most frequent to negroes)—what is the relation? Diet, as mentioned in the observations of DeLange, does not seem to be the deciding factor. Again, the cholesterol and bilirubin estimation are of no diagnostic value. The effect of predisposing causes as (a) occupation in negro (outdoor and active), causing less stagnation in bile passages, can only be considered as a minor factor. (b) constipation less frequent in negroes because of the mode of living indirectly lessening infection may have some relation. During pregnancy in the colored female, all conditions seem to be the same as in the white woman: hypercholesterolemia, all factors relating to bile stagnation, etc. Why not the formation of calculi in the same proportion as in the white female? In the colored male, just as many are sufferers from cardiac disease plus arteriosclerosis and nephritis (hypercholesterolemia) forcing sedentary life, why not the formation of calculi? No matter what other predisposing or immediate factors exist, we are

still at a loss to conclude other than "Unity of species and multiplicity of races involve the liability of all men to common diseases which will at the most vary in accessory phenomena, but allow the existence of diseases more or less peculiar to certain human groups"

NOTE Since the writing of this article, I have endeavored to collect the number of cases occurring in Charity Hospital New Orleans Louisiana from June 1 1925 to July 1 1926. There were 17 cases in the white—13 in the female 4 in the male—acquired from the operative records, and 8 cases in the negro of which 6 were acquired from operative records and 2 from autopsies.

Of the six operative cases 4 were male and 2 female all males showing bilirubinate stones. In the female one case showed stones of cholesterinn origin and the other bilirubinate. In the males 2 occurred with empyema and gangrenous gall bladder.

Of the calculi found at autopsy one was in a negro female who had multiple cholesterinn stones (in conjunction with uterine carcinoma with metastasis) and the other was in a negro male with bilirubinate stones.

It will be of interest to note the increase of cases tabulated in one year compared to the previous 18½ years.

BIBLIOGRAPHY

- 1 ALBUTT and ROLLESTON System of Medicine 1910, 11 pt 1 751
- 2 *Ibid* p 254
- 3 BACHMEISTER A Ergebn inn Med 1913 11 1
- 4 BARKER J Am M Ass 1920 lxxv 1103
- 5 CAMPBELL Quart J Med 19 3 393-4

- 6 CHAIKY et al Bull Soc med d bôp de Par 1925, xlix 1252
- 7 DELANGE Press méd 1916 xlii 352
- 8 GOULD and WARREN International Textbook of Surgery, 1905, 11 741
- 9 HERMANN and KORNFIELD Zentralbl f Gynaek 1905 xlix 2225
- 10 J Am M Ass editorial, 1925 lxxxv 771
- 11 MANN BOLLMAN, and MAGATH Am J Physiol, 1924 lxxv 393
- 12 MATAS, RUDOLPH The Surgical Peculiarities of the American Negro Tr Am Surg Ass, 1896
- 13 MAYO Ann Surg, 19 5 lxxxv 935
- 14 MICHAUD Quoted by Mayo loc cit
- 15 MITCHELL LOUIS J Ann Surg 1918 lxxviii, 289
- 16 MOSHER Quoted by Rolleston loc cit
- 17 MOSHER Bull Johns Hopkins Hosp, 1901, xii 253
- 18 MOYNIHAN Brit M J 19 5 1 393
- 19 OPARENA Ztschr f inn Med, 1924, 185
- 20 QUATREFAGES The Human Species 1879
- 21 RAVDIN Am J M Sc 1925 clxix, 850
- 22 RICH Bull Johns Hopkins Hosp 1925, xxxvi 233
- 23 ROBERTSON Principles of Biochemistry 1924 2d ed
- 24 ROLLESTON Diseases of the Liver, Gall Bladder, and Bile Ducts, 1905
- 25 ROSENOW J Infect Dis 1916 xix 577
- 26 ROTHSCHILD and WILENSKY Am J M Sc, 1918 156 739 404 564
- 27 ROUS McMASTER and DRURY J Exper Med 1924, xxxix 97-116
- 28 SHATTUCK BROWNE and PRESTON Am J M Sc, 1923 clxx 469-514
- 29 SHEARD Am J Physiol, lxxviii 497
- 30 SIMONS Physiological Chemistry 1907 ed ed
- 31 UNITED STATES MORTALITY STATISTICS 1920 1922 Quoted by Barker loc cit
- 32 WALTON Cited by Moynihan loc cit
- 33 WHIPPLE Physiological Review 1922 11 440

RESULTS WITH THE WATKINS INTERPOSITION OPERATION IN THE TREATMENT OF PROLAPSUS UTERI

By LEO BRADY, M D BALTIMORE

From the Department of Gynecology of the Johns Hopkins Hospital and University

THIS article has been written not for the purpose of bringing forward any new procedure in the treatment of prolapsus uteri, but with the intent of summing up the results obtained with a method which has now stood the test of more than a quarter of a century. With the advent of the Watkins interposition operation in 1898 (1) a new era began in the handling of these troublesome cases. Various modifications of this operation have been devised from time to time some of which have proved advantageous in meeting certain special conditions and have enhanced its value but now 28 years after Watkins' first publication on this subject a vaginal interposition of the uterus in its essentials the same as that first done by that pioneer is still probably the best means of treating prolapsus uteri in women past the childbearing age.

With the idea of determining the final results obtained with this operation the writer decided to make a thorough study of a series of cases. But one difficulty was apparent right at the start of this investigation. It is rare to find a single month in which one or more journals do not contain some proposed change in one or more of the steps of the original operation. Doubtless some of these modifications are of real value others are in consequential while others would render less efficient the procedure described in 1898. The net result of all this is that one seldom sees two operators do exactly the same Watkins operation. For this reason it seemed better to study the end results in a series of patients operated on by one man rather than a similar series in which several different surgeons had participated.

The series of 56 patients in the records of Dr T S Cullen is of special interest because the early ones were operated on as far back as 17 years ago and because Doctor Cullen has consistently performed the same operation on

all. An article published in 1922 (2) contains an exact description of the operation carried out on these 56 patients. It is true that in his paper Doctor Cullen advocates the use of sutures as tractors in the vaginal operation for prolapsus but this suggestion, though important must not be regarded as a modification of the original Watkins operation but only as supplying a method which facilitates the carrying out of one of its essential steps.

The average age of the patients in this series of cases was 54 years. Twelve women were over 60 seven over 65 and two over 75 years old. Only one patient was under 45 years of age. At the present time, of course, it is a well recognized rule that a vaginal fixation of the uterus should never be done on a woman in the childbearing age unless at the same time the patient is sterilized. In one instance only was this rule broken in this series of cases. The patient Mrs V C, aged 37, had a vaginal fixation of the uterus performed on her April 24, 1909 without simultaneous sterilization. In the last few weeks we have heard from her that the operation was a complete success and that she has had no further trouble since. Fortunately, she has never become pregnant. Seventeen years ago the complications that developed as the result of a pregnancy occurring in a woman on whom a vaginal suspension of the uterus had been performed, were not appreciated so well as they are now.

The average number of children that these patients had had was four. None had borne more than ten although several had had seven or eight. Several had had only one pregnancy. From a study of this series of cases it seems probable that the damage incident to the first labor plays a more important rôle in causing prolapsus uteri than the number of pregnancies.

The symptoms complained of were the usual ones caused by procidentia backache

constipation, difficulty in voiding, and "falling of the womb." In all instances, there was, at least, a marked prolapse of the uterus present and in many the entire uterus lay outside of the vulva. Lacerations of the cervix, marked cystoceles and rectoceles were quite common. No cases of prolapsus uteri were considered extensive enough to contra-indicate this operation, our method of procedure differing from that carried out in certain clinics in which a vaginal fixation is performed in cases of marked cystocele only, whereas other operative procedures are preferred when the entire uterus lies outside of the vulva.

The operative procedure has so consistently been in its essentials that of the original Watkins operation that no details are here necessary. One operation, however, may be mentioned. Mrs. H. G. had a supravaginal hysterectomy performed in 1916 for fibroids. Six years later, she was found to have a marked dropping down of both the anterior and posterior walls of the vagina. Doctor Cullen was able to use the cervix just as one ordinarily uses the complete uterus in a Watkins operation and, by doing a vaginal fixation of the cervix, corrected both the marked cystocele and the prolapse of the cervix. An extensive posterior repair corrected the rectocele. It is now 4 years since the second operation and the patient has had no further trouble.

There were no operative deaths in this series of cases. Postoperative complications occurred in three instances, two patients having postoperative hemorrhages and one developing a chronic cystitis. In the case of Mrs. F. S. the bleeding started 2 days after operation, while Mrs. F. J. had a severe hemorrhage on the eleventh day. It was necessary to take these women to the operating room to control the bleeding which, in both instances, was due to the too rapid absorption of the catgut used in repairing the perineum. Both of these patients made a complete recovery and their symptoms were completely relieved. Mrs. E. B., unfortunately, developed a postoperative cystitis which became chronic and worried the patient for several months. As this is the only instance of this complication, it makes the frequency of post-

operative cystitis following a Watkins vaginal fixation less than 2 per cent. This figure is probably as low as would be found to occur in a series following any of the major gynecological operations.

Questionnaires were sent to each of the 56 patients in which they were asked if their health had improved after the operation, if the symptoms of which they had complained were relieved, if they had had any further operative procedures performed after the Watkins operation, and if they had had any later trouble which might have been caused by the operation.

Of the 56 patients to whom questionnaires were sent, 48 have been heard from. Eight we were unable to trace, but of these five had been operated on over 12 years previously. One woman out of the 48 traced, later on had a second operation performed for procidentia. The history of this case is somewhat as follows. Mrs. G. D. was first operated on by Doctor Cullen in 1908 at the Johns Hopkins Hospital. At that time, she had a marked prolapse of the uterus with a cystocele and a rectocele. When the patient stood up the cervix protruded several centimeters outside of the vulva. Doctor Cullen performed the usual Watkins interposition operation. For 10 years after the operation the patient had absolutely no symptoms. In the eleventh year symptoms of procidentia returned and on examination a marked pocket in the anterior vaginal wall was found below the bladder. By performing an extensive cystocele operation, Doctor Cullen corrected the dropping of the anterior vaginal wall, and for 6 years the patient has had absolutely no symptoms. As the Watkins operation failed to cure the procidentia permanently and because a second operation was necessary, we have put this case down as a failure, but as the operation completely relieved the patient of all symptoms for a period of 10 years, the failure cannot be termed absolute.

One patient, Mrs. R. B., wrote that her health had improved since operation and that she had not been operated on again, but that the symptoms of which she had previously complained had been only partially relieved. Another patient, Mrs. A. H., was free from

P t t	Hospital	D te of per to	Flow up result
1 VC	CHI	4 3 1000	Dec 19 5 Ex II t
2 JT	CHI	4 6 1000	N t c d
3 CR	CHI	5 12 013	N t c d
4 JT	CHI	5 12 013	Dec 19 5 F cell t
5 MC	CHI	5 25 0 3	F m ned 012 E cell t
6 VB	CHI	0 1 013	N t c d
7 BC	CHI	1 10 3	N t c d
8 JC	CHI	4 0 11	Sept 10 5 F H nt
9 JC	CHI	4 10 5	0 11 t
10 W	CHI	3 10 5	N t c d
11 AT S	CHI	3 10 5	Sept 10 5 F cell t
12 FT	CHI	6 6 10 6	F m ed 0 0 F cell t
			D ed 1 m oth al t
			10 0
13 CR	CHI	1 6 0 6	F m ned 0 3 F H nt
			D d h m th co l
			10 4
14 AN	CHI	0 0 10 7	Nov 10 5 Facell nt
15 CHD	CHI	1 0 2	Sept 10 5 F cell t
16 AR	CHI	0 10 0 17	Sept 10 5 F cell t
17 JH	CHI	0 0 7	Sept 10 5 F cell t
18 LL	CHI	2 5 0 15	S pt 10 5 F cell t
19 LR	CHI	3 0 10 2	N v 10 5 E cell nt
20 EL	CHI	4 5 0 8	N v 10 5
21 EB	CHI	4 6 10 15	Nov 10 5 Improved but res h not perfect
			N 19 5 E H nt
22 MD	CHI	5 11 19 5	Sept 10 5 F H nt
23 JH	CHI	6 5 10 15	N t traced
24 MC	CHI	7 6 10 5	Nov 10 5 Improved but res h not perfect
25 MC	CHI	7 3 0 15	Sept 10 5 F cell t
			Sept 10 5 E H nt
26 AN	CHI	11 0 0 9	Sept 10 5 Operation
27 CK	CHI	10 10 18	laud
28 MG	CHI	1 5 10	Sept 10 5 F cell t
			Sept 10 5 F cell t
29 FC	CHI	5 5 0 0	Sept 10 5 F cell t
30 WF	CHI	5 5 0 10	Sept 10 5 F cell t
31 FJ	CHI	4 5 0 9	Sept 10 5 F cell t
32 MD	CHI	5 5 0 10	Sept 10 5 F cell t
33 LH	CHI	6 13 10 9	Sept 10 5 F cell t
			Sept 10 5 F cell t
34 FC	CHI	1 5 0 0	Sept 10 5 F cell t
35 LH	CHI	7 0 1	Sept 10 5 F cell t
36 TG	CHI	1 10 0 10	Sept 10 5 F cell t
37 RC	CHI	5 5 0 10	Sept 10 5 F cell t
38 CC	CHI	0 0 0 0	Sept 10 5 F cell t
39 CH	CHI	0 10 0 2	Sept 10 5 F cell t
40 EL	CHI	10 0 0 2	Sept 10 5 F cell t
41 JH	CHI	4 0 11	Sept 10 5 F cell t
42 MC	CHI	3 0 9	Ag 0 5 F cell t
43 HGG	CHI	4 0 0	Sept 10 5 F cell t
44 MFC	CHI	6 0 10	N 0 5 F cell t
45 HF	CHI	0 1 0	Sept 10 5 F cell t
46 HH	CHI	7 11 10	Not traced
47 JLC	CHI	10 5 0	Sept 10 5 F cell t
48 RB	CHI	1 31 0	Sept 10 5 F cell t
			Sept 10 5 F cell t
49 FM	CHI	11 0 0	Sept 10 5 F cell t
50 MC	CHI	1 1 10	Sept 10 5 F cell t
51 JT	CHI	3 5 0 14	Sept 10 5 F cell t
			Sept 10 5 F cell t
52 JS	CHI	6 0 4	Sept 10 5 F cell t
53 FSS	CHI	11 4 0 4	Sept 10 5 F cell t
			Sept 10 5 F cell t
54 CD	CHI	2 4 0 4	Sept 10 5 F cell t
55 LN	CHI	2 10 10 5	Sept 10 5 F cell t
56 JHS	CHI	5 0 0 5	Sept 10 5 F cell t

CHI Ch reb Hom I firm ry
JH H Johns Hopkins Hospital

symptoms for 1 year after operation and on examination showed no evidence of proci dentia, but she had developed a cystitis a year after operation and did not feel that her health was greatly improved by the operation. The results in these two cases we have put down as only partial successes, although on exami

nation there was no evidence in either case that the operation had failed to accomplish what it was intended to do.

Forty five out of the 48 women or 93 per cent made a complete recovery from their operation and were entirely relieved of all the symptoms of proci dentia of which they had previously complained.

Many of these women in addition to being heard from were re examined at varying periods after their operation. In no instance was there any descent of the uterus.

Sixteen of these patients were operated on during the last 5 years twenty between 5 and 10 years ago five between 10 and 15 years ago and in one case 17 years have elapsed since the operation was performed.

There is no doubt that a vaginal fixation of the uterus is a procedure provocative of much less shock than any suspension which necessitates opening the abdominal cavity. The results of this study seem to justify the opinion that the writer felt before starting this work namely that a vaginal fixation of the uterus is the operation of choice in treating prolapsus uteri in women beyond the child bearing age not only because it causes less shock than other procedures, but because it yields such good results.

The favorable opinion which the writer held of the value of this operation before beginning this study was based on the uniform good results which he had obtained in the 11 cases in which he himself had performed this operation. He realized however that this number of cases was too small and too many of the patients had been operated on during the last few years for him to draw any conclusions from his own work. The advantages of using Doctor Cullen's private cases for this study are (1) the large number of cases in the series (2) the fact that the same operation has been consistently performed on these patients, and finally, because in so many instances several years have elapsed since the operation was performed. I wish to thank Doctor Cullen for his permission to avail myself of his large experience with this operation.

In conclusion, this study has shown that 45 out of 48 patients on whom this operation was performed were completely relieved of all

symptoms of procidentia and had no return of the condition. Two patients were not completely relieved of all their symptoms but on re-examination showed no evidence of procidentia. In one instance, the only known failure in the series after 10 years the patient began to have further trouble and a cystocele developed.

It is doubtful if a study of a series of cases of prolapsus uteri treated by any of the other operative procedures would show any better

end results and the fact that the Watkins interposition operation causes the least shock of any of the operations for the correction of this condition certainly should be emphasized.

REFERENCES

1. WATKINS, T. J. The treatment of cystocele and uterine prolapse after the menopause. *Am. J. Obs. & Gynec.*, 1899, Nov.
- CULLEN, T. S. The use of sutures as tractors in the vaginal operation for prolapsus. *Am. J. Obs. & Gynec.*, 1902, Nov.

PREGNANCY AFTER SALPINGECTOMY

By MARION DOUGLASS M D CLEVELAND OHIO

From the Department of Gynecology Western Reserve University School of Medicine and the Lakeside Hospital

THE sterility which follows bilateral salpingectomy is one of the most important problems for the gynecological surgeon. This is so because of the wide distribution of pelvic inflammatory disease and the fact that the victims of the condition are usually women in the childbearing period. Although many agree that radical operation is the method of choice the individual surgeon is constantly disturbed by a desire to leave his patient capable of impregnation. Conservation of diseased tubes commonly results in the necessity for further surgery. Any method of bilateral salpingectomy which offers a hope that future pregnancies may occur would be of the greatest value.

Considerable experimental work has been done in the transplantation of ovaries in an effort to preserve not only the menstrual function but also the possibility of pregnancy. Retention of a certain amount of intact uterine mucosa and sufficient ovarian tissue will maintain the former but the establishment of a permanent artificial mode of entrance to the uterus for the ovum is essential to the latter.

To date the operative attack has been two fold: (1) suspension of the ovary within the uterine cavity 'like a polyp' (2) creation of an artificial intimate connection of the ovary to the uterus at its cornu or in a remnant of a tubal appendage.

Morris (13) by means of a free autotransplant of ovary placed in the stump of a tube, was successful in obtaining a pregnancy terminated by abortion. His case of a full term pregnancy (1906) following bilateral oophorectomy and a free graft in the broad ligament of homogenous ovarian tissue the tubes being intact, may have been due to ovulation of accessory autogenous ovarian tissue and is not an undoubtedly successful example of a homogenous ovarian graft. Bainbridge (1) in 1923 reported a case operated upon in 1905 in which pregnancy went to term normally after a free graft of ovary covered by

omentum was placed in the stump of the tube. The special operations of Franklin Martin (10), Dudley (5), and Storer (16) were followed by pregnancy, but terminated finally in abortion. Tuffier performed numerous transplantations and reports a case of Petit (1908), in which a fragment of left ovary, following bilateral salpingectomy and right oophorectomy was inserted on its pedicle into the uterine cavity. Menstruation persisted although reduced in amount and full term pregnancy followed. In a recent article Tuffier elaborated his method, which is suspension of the ovary upon its own pedicle within the artificially dilated uterine cavity following a vertical posterolateral incision of the uterus. He reported 23 cases with no deaths. No pregnancies have occurred except in the case of Petit. Tuffier states that in his hands the method is more satisfactory than extrapelvic transplantation. In addition his method offers the possibility of pregnancy. Dysmenorrhea he finds is annoying so far as the maintenance of menstruation is concerned but it does not usually persist. Histological examination of ovaries transplanted into the uterine cavity, following hysterectomy at a later date shows normal ovarian tissue with atrophy and connective tissue proliferation on the side toward the uterine cavity.

The series of cases reported by Estes (6) included four pregnancies, two of which went to term normally. Of this series 22 women had demonstrated their fertility before contracting pelvic disease which rendered salpingectomy necessary. His operation is a peri uterine transposition leaving a certain amount of the interstitial or uterine portion of the tube *in situ* and fixing a portion of the corresponding ovary on its pedicle directly over it. He completes peritonization with the round ligament fixed to the posterior surface of the uterus. A slight variation of this method has been employed by the writer in a small series of cases, one of which, however,

yielded a pregnancy within 6 months after operation. This was followed by spontaneous abortion in the tenth week.

Results of intra uterine placement on its own pedicle is exposed to the following criticisms: that a pedicle sufficiently free from constricting scar tissue properly to supply the ovary with blood must necessarily disturb the integrity of the uterine musculature, which might be dangerous at parturition. Experimentally in guinea pigs and rabbits ovaries or pieces of ovary implanted into the uterine cavity or projecting into it or into the cornu are quickly excluded from the cavity and cannot ovulate into it (Tuffier). This might account for the fact that intra uterine transposition in the most skilled hands has been practically barren of results in the form of conception except the reported pregnancy with abortion of Dudley (5), and the case of Peat cited by Tuffier previously referred to. The ovary suspended on its own pedicle within the uterine cavity may act as a foreign body. This fact is expressed by scar tissue isolation of the ovary from the uterine cavity preventing ovulation into it, and by scar tissue and atrophic changes in the ovary occurring in the intra-uterine portions (Tuffier) and presumably by the production of such uterine instability that even a fortuitously occurring pregnancy would abort.

The difficulties on the other hand, of securing success from a peritonial transposition at the cornu are several. The tube is frequently severely involved in its interstitial portion (salpingitis isthmica nodosa) and it is impossible in the presence or even in the absence of any activity of the inflammatory process to guarantee the continued patency of this portion of the tube. It naturally follows that the more nearly the cornu has direct access to the uterine cavity the greater is the chance of pregnancy to occur. The method to be described, theoretically at least, escapes some of the obstacles which militate against pregnancy occurring after other procedures.

THE OPERATION

Salpingectomy is performed and the cardinal vessels of the mesosalpinx are ligated to secure as perfect as possible hemo-

stasis. The superior portion of the uterine artery is ligated immediately below the attachment of the tube and the tube is removed with a deep wedge of uterine musculature down to but not actually perforating, the endometrium and leaving the smallest amount possible of the intra-uterine portion of the tube. The ovary is carefully mobilized, the better one being selected if only one is to be transplanted and the pulsation of the ovarian artery noted. A long infundibulopelvic ligament which allows the ovary easily to be moved to the cornu of the corresponding side without tension is a distinct advantage. The ovary is radically resected in such a manner as to leave the greatest amount of cortex, wherein the follicles are the most abundant, and the ovary is diminished to about half its normal size. Careful ligation of the fundal uterine branch gives much better hemostasis. The resected ovary largely made up of cortex is carefully sutured into the wedge-shaped defect with mattress sutures of fine catgut and its redundant edge fastened with a continuous circular suture of the same material. The round ligament is picked up about 5 to 6 centimeters from its uterine attachment and is sutured to the posterior surface of the uterus completely covering the cornu with its implanted ovary. The round ligament of the opposite side is placed posteriorly in a similar manner suspending the uterus symmetrically.

In a series of four cases following salpingectomy the resected ovary was sutured into the cornu of the uterus unilateral implantation only being employed.

CASE 1. The patient was a white female, age 27, 1 para. A bilateral salpingectomy, appendectomy and left ovarian transplantation were performed. The diagnosis was bilateral hydrosalpinx with adhesions. Menes were regular 8 months following operation. She is subjectively well.

CASE 2. The patient was a white female, age 26. Three previous spontaneous abortions had occurred at 2 months. Wassermann reaction was negative. Right salpingo-oophorectomy and left salpingectomy had been performed 4 years ago. Present operation was done for a left tubo-ovarian mass. After clamping and curettage the left tube was removed. The diagnosis was salpingitis with adhesions, cystic left ovary. Resection of left ovary and implantation in a cornu of uterus were done. Her menstrual period 3 months later was missed. Ten weeks later she was readmitted for uterine

bleeding of 1 week's duration with passage of large clots. No trace of fetus was seen. She was curetted and the pathological report was typical placental tissue with infection. Hence impregnation occurred within 3 months of the patient's discharge from the hospital.

CASE 3. The patient was a white female, age 23, nullipara. At operation a bilateral salpingectomy was performed for subacute salpingitis. Implantation of right ovary was done. Left ovary was normal and was not disturbed. Convalescence was uncomplicated. Menses are normal and the patient is subjectively well 1 year later.

CASE 4. This patient was a white female, age 26, nullipara. Laparotomy showed congenital absence of left tube and ovary accompanied by right-sided subacute salpingitis with adhesions. Salpingectomy and implantation of right ovary was performed. The menses are regular and the patient is subjectively well 1 year from operation.

In this short series of cases several things are worth noting. Young women well within the early part of the childbearing period were selected as obviously they possess the highest grade of natural fertility. Two of the cases had previously demonstrated their fertility. The social status and social desirability to a lesser degree were considered, each of the cases being at least an average type of white woman.

Most important among considerations for or against the procedure is the condition of the uterus and adnexa. We regard interstitial salpingitis or abscess as an absolute contra-indication for the obvious reason that the portion of the ovary denuded of its resistant covering sutured to the inflamed cornu invites an ovarian abscess.

Clinical symptoms referable to the procedure have been almost entirely absent, menses being quite normal for the immediate post-operative period and pain, except in one case in which a small cyst of the implanted ovary gave symptoms, has not occurred. Dysmenorrhea was noted only in two cases for the first few months after which it spontaneously disappeared. The tendency for spontaneous abortion to occur is inherent; it would seem in any operation procedure which disturbs the position, tension, ligaments of the uterus, or the integrity of its musculature in any way.

Improvement in operative technique may lead to the development of a method which

will have no higher rate of abortions than has the impregnated normal uterus. The fact that impregnation does occur after salpingectomy by operative methods of transplanting the ovaries merits further investigation.

REFERENCES

1. BAINBRIDGE W. S. Double salpingo-oophorectomy with partial auto-ovarian transplantation followed by 12 years of menstruation, normal pregnancy and uncomplicated menopause at 51 years. *Am. J. Obst. & Gynec.* 1923 v 379.
2. Idem. Transplantations of human ovaries. *Am. J. Obst. & Gynec.* 1923 v 493.
3. BALDWIN J. F. Pregnancy after removal of both ovaries. *Am. J. Obst. & Gynec.* 1902 xlii 83.
4. CHALPANT S. A. Subcutaneous transplantation of ovarian tissue: report of 32 cases with special reference to the effect of such transplantation on the menopause. *Surg. Gynec. & Obst.* 1913 xxi 579.
5. DUDLEY H. B. Intra uterine implantation of the ovary. *Post graduate N. Y.* 1900 xv 346.
6. ESTES W. L. Jr. Ovarian implantation: preservation of ovarian function after operation for disease of pelvic viscera. *Surg. Gynec. & Obst.* 1924 xxxv 394.
7. Idem. Further results with ovarian implantation. *J. Am. M. Ass.* 1924 lxxiii 674.
8. ESTES W. L. Implantation of a part of an ovary into a horn of the uterus in order to preserve the functions of ovulation and menstruation. *Med. Times N. Y.* 1922 l 132.
9. FRANK H. Ueber Transplantation der Ovarien. *Zentralblatt f. Gynaek.* 1898 xvi 445.
10. MARTIN F. H. Ovarian transplantation and reconstruction of fallopian tubes with report of two cases and review of the literature. *Chicago Med. Rec.* 1903 xiv 1.
11. Idem. Ovarian transplantation. *Surg. Gynec. & Obst.* 1922 xxxv 573.
12. Idem. Ovarian transplantation: a review of the literature and bibliography up to and including the early months of 1915. *Surg. Gynec. & Obst.* 1915 xxi 568.
13. MOXZIS R. T. The ovarian graft. *New York M. J.* 1895 lvi 436.
14. Idem. A case of heteroplastic ovarian grafting followed by pregnancy and delivery of a living child. *Med. Rec. N. Y.* 1906 lxxv 697.
15. POLAK J. O. Pelvic Inflammations in Women. *New York: Appleton & Co.* 1921.
16. STOKER M. An ovarian transplantation with report of a case of implantation into the uterus with resulting pregnancy. *Boston M. & S. J.* 1914 cxxii 47.
17. TRACY S. E. The present status of surgery in the treatment of fibro-myomata uteri. *Am. J. Obst. & Gynec.* 1921 v 135.
18. TURPETER T. Transposition of ovary with its vascular pedicle into the uterus after salpingectomy: technique and anatomical results (23 operations). *Surg. Gynec. & Obst.* 1924 xxxv 401.
19. Idem. Transplantation of ovaries. *Surg. Gynec. & Obst.* 1915 xi 30.

HERNIA OF THE OVARY

By WILLIAM JAMES MOORE FRIPS (GLAS.), GLASGOW SCOTLAND

Late Assistant Surgeon of the Royal Samaritan Hospital, Glasgow, Late Surgeon to Out Patients of Victoria Infirmary Glasgow and Fellow of the Royal Society of Medicine London

HISTORY

The first authentic record of hernia of the ovary is that of Soranus, of Ephesus, in 97 A.D. From the time that Soranus made his original report, until the seventh century, no further record is found. In the seventh century, Paulus Aegineta, of Alexandria, in writing upon the use of the transverse abdominal incision mentions the fact that he has often found the ovary present in young girls the subjects of inguinal hernia, and has, in many cases removed it. The most definite statement is by Deneux (7) in 1813, who reports 9 cases of inguinal hernia with the ovary as a content of the sac. In 1814, Hamilton (13) records 12 cases, in 1864, Englisch (10) records 27, and in 1879, Puech (32) records a total of 166 cases. In Kelly's (17) *Textbook of Gynecology* published in 1898, he says that in a large experience he has seen but 2 cases of hernia of the ovary, both being associated with congenital malformations. Andrew (2), in 1905, after an exhaustive search, has been able to collect only 167 cases. Most of the reported cases seem to have been associated with other congenital deformities.

On the pathology of hernia of the ovary there are important papers by Wibaille (38), Barnes (3), Thomas (36), Menega (26), and Menciére (25). All these accounts are published between 1874 and 1897. In 1923, Watson of Chicago, reported in his book of hernia 156 cases. Herzfeld (14) in June, 1925, reports having found the ovary forming the main content of the sac, but it is not stated definitely that it was the one and only content. So that in 1925 the date of the present paper, there would be apparently, including the present one, a total of 157 cases. In some of the records it is difficult to be certain that the ovary was the only content of the sac. I have found no record of Percival Pott's (31) case except that it is recorded in Sir J. Y. Simpson's (35) book on acupressure. Without doubt many other cases have been found but not reported.

IN conversation one evening with an abdominal surgeon of international repute (W.D.M.), and in course of some observations upon hernia in general, I was surprised to learn that he had never met with a case of inguinal ovarian hernia. I was then able to introduce him to a case of my own which because of its rarity, really uncomplicated type, and very interesting family history, was thought to be of sufficient importance to justify its being placed upon record.

The study of this case, to my mind, very strongly supports the view I have always held, namely, that all hernias are congenital and not acquired either by any sudden or gradual increase of intra abdominal tension or pressure, of course I exclude those cases in which the peritoneum and other layers of the abdominal wall are ruptured as the result either partially or wholly, of any single violent act.

The case also presented difficulties in its diagnosis, and various opinions had been expressed by different men, but not one suggested that the ovary might be at fault. An interesting family history accompanied the case.

Now, also, 18 months after operation, there is a distinct suspicion that hernia of the left side might, in time, develop. Lastly it is to be noticed that the ovary which was the content of the hernial sac was decidedly cystic and was the seat of premenstrual pain. And this is interesting in view of the statements of certain well known authorities that cystic ovaries do not produce pain. It is also of interest from a medicolegal point of view, that the final crisis was produced as the result of a single act, and that pain, swelling, and sickness were at once produced thus proving that there was an aggravation of the pre-existing condition.

The operation performed was Macwen's (21), with the slight modification that a part of the sac was removed.

I believe that the condition is still rare enough to be regarded as a surgical curiosity

INCIDENCE

From all accounts in literature ovarian hernia would appear to be more frequently found on the right side than on the left, but why that should be so it is difficult to understand. It may be on account of the fact that that is the side of the body subjected to the greatest strains. But most cases have been found in infants under 1 year, only 16 cases are reported as having occurred between the ages of 21 and 30 years.

In 136 cases 47 were right sided and 27 left sided, 17 were bilateral, and in 41 the side was not stated.

In no instance have I been able from the records to discover whether or not heredity played any part except in my own case in this instance the maternal history is an extremely interesting one.

CASE HISTORY

Mrs J. C. N. aged 30 years about 57 years ago had pain at times in the right inguinal region but saw or found nothing and paid no great attention to it. At 53 she commenced to menstruate and then for the first time noticed a swelling in the right inguinal region. Immediately before and during the period the pain was worse and she also noticed that the swelling increased in size and lasted for 4 or 5 days. The pain was always preceded by sickness and after she had vomited she obtained relief. At times there was pain for a few days between the periods but it was always worse at the time of her monthly illness.

This condition lasted on and off for 14 years until one day when washing blankets she jerked herself and after that the small lump in the right inguinal region became more noticeable and this increase in size was in evidence until the time of the operation. Throughout these years she had several attacks of pain which confined her to bed for several days at a time. She was seen by different medical men who expressed various opinions in regard to the nature of the swelling. The last painful attack was an acute one which confined her to bed throughout the week preceding the operation.

Her family history is an interesting one. Her maternal grandfather had a rupture throughout his life and died at the age of 74. Her maternal uncle is aged 60 and has a double rupture. A maternal cousin also is living who has suffered from a double rupture since childhood.

Examination. The general condition is excellent. In the right inguinal canal is an oval swelling just

internal to the external abdominal ring which protrudes slightly when the patient coughs.

On palpation the swelling is approximately $3\frac{1}{2}$ inch square. It is soft elastic and mobile and gives one the impression of being surrounded by a soft substance. Firm pressure produces a sickening pain. When the patient coughs there is a slight impulse transmitted to the examining fingers. The percussion note is dull. An attempt was made to reduce the swelling but was unsuccessful.

Diagnosis. The possibilities in this case were considered to be (1) enlarged inguinal glands (2) an ordinary inguinal hernia containing omentum (3) a fibroma of the round ligament (4) a fibroma or desmoid tumor of the abdominal wall (5) an abscess or (6) a hernia of the right ovary. The last was the diagnosis made prior to the operation because (1) the pain on pressure was referred to the epigastrium (2) the swelling enlarged at the time of the monthly illness and (3) became prominent just before menstruation (4) pain was much less in evidence between the periods and (5) there was subsidence of the pain at the onset of the monthly flow.

A diagnosis of right sided inguinal hernia with the right ovary as the content of the sac having been given operation was advised.

Operation. September 6, 1923. The patient was prepared in the usual manner. Chloroform anaesthesia was induced by Dr. Dobbin. Assisted by Dr. Clark, I made a transverse incision $3\frac{1}{2}$ inches in length over the external abdominal ring the pillars of which were found to be loose. The hernial sac at once presented and was then separated from the round ligament which was lying at its inner side. When the sac was opened a very small quantity of fluid escaped and the right ovary was found to be its one and only content and this was undergoing cystic degeneration. It was removed in the usual manner.

The sac was dealt with by MacEwen's method, the conjoined tendon being stitched to the under surface of Poupart's ligament and the pillars of the abdominal ring closed. The subcutaneous tissues were closed by a subcutaneous and the edges of the skin incision approximated by a Halstead subcuticular stitch. This I believe to be a very effective preventive against infection of the wound. With this method I have never seen stitch abscess result. Collodion dressing was then applied.

Her convalescence was uninterrupted and 17 days later she was dismissed from the hospital.

Follow on notes. March 19, 1925. It is very difficult to see the operation scar, only a faint white streak visible on the most minute inspection. There has been no recurrence of the hernia, the parts being absolutely firm. It is extremely interesting to note that at this date we find that there is a distinct Eugene Pool bulge in the left inguinal region and that at times she has a slight pain in that situation. It is also to be noted that when the patient coughs there is a slight impulse conveyed to the examining fingers.

SIGNS AND SYMPTOMS

In the child the presence of the ovary in the inguinal canal may cause no discomfort at all, it is simply noticed as a swelling to which little if any attention is paid. With the advent of puberty the swelling enlarges, becomes painful, and may cause sickness and vomiting, and the pain may be referred to the epigastrium, or, in fact, to any part of the abdomen.

With the onset of the menstrual period the pain increases markedly in severity, and the swelling becomes more pronounced, but as the illness proceeds these symptoms gradually diminish both in intensity and in prominence so that after the first 2 or 3 days, all discomfort has disappeared. In this case the symptoms were so severe that the patient was completely prostrated for a few days at the time of the period.

DIAGNOSIS

In addition to the ordinary signs and symptoms of inguinal hernia, the following signs of hernia of the ovary may be considered as pathognomonic, and may be described as *external* and *internal*.

Internal signs. By rectal or vaginal examination, we find the uterus drawn toward the side of the swelling, an absence of the ovary from its normal position, and the presence of a mass at the internal abdominal ring. Traction upon the uterus produces movement of the swelling in the canal.

External signs. A swelling is present which may or may not change its position on any muscular exertion such as coughing, and is situated above Poupart's ligament. The symptoms are intermittent pain, worse before and during the onset of the period and absent between periods, variation in size, and a feeling of fullness in the parts. On palpation, one finds a solid mass, relatively or freely movable, that transmits an impulse on coughing, is dull to percussion, non translucent, and non fluctuant, and that does not disappear on the assumption of the recumbent position.

With these signs and symptoms present, a diagnosis of hernia of the ovary is reasonably assured. In connection with this section, I have composed, and here insert, a differential

DIAGNOSTIC TABLE—POSSIBLE CONTENTS OF INGUINAL CANAL

Normal contents	Round ligament Vessels Nerves	Tumors Cysts	Histiomata fibroid lipoma Cytomata desmocyotomata	
Abnormal contents	Intestine	Colon caecum	Appendix	Appendicitis
		Small intestine	Meckel's diverticulum	Diverticulitis
	Uterus	Tumors	Histiomata Cytomata	
		Pregnancy		
	Tubes	Tumors	Histiomata Cytomata	Carcinoma Desmocyotomata
		Inflammation	Salpingitis	Tuberculous Pyogenic
			Pyosalpinx	
	Ovaries	Pregnancy		
		Cysts Inflammation Tumors	Histiomata Cytomata	Fibroid Carcinoma Desmocyotomata
	Bladder Ureter Omentum			

diagnostic table with reference to possible contents of hernias of the inguinal canal. The scheme of the table should explain itself. The table should perhaps help to clear ideas, through what possibly might become a maze, conveyed only by means of an untalented description.

TREATMENT

The condition may be dealt with either palliatively or radically. The palliative treatment is practically always unsuccessful because of the discomfort and in certain cases because of the actual pain that is produced by the pressure of the pad of the hernial truss.

The operation of choice was that which was advised by the late Professor Sir William MacEwen (21). It has many advantages, the chief being that it restores the anatomical relationship of the parts, one to another, without any of them being sacrificed. The only structures cut are the skin and the subcutaneous tissues.

Briefly, the operation as performed by the author is a transverse incision over the external abdominal ring, $1\frac{1}{2}$ to 2 inches in length,

through skin and subcutaneous tissues. The external abdominal ring is found, the hernial sac is identified and carefully isolated from the surrounding structures. It is then taken up between two pairs of pressure forceps, and, with the knife held obliquely, is opened and its contents examined and then reduced to the abdominal cavity. The sac is next transfixed by a round needle threaded with No. 2 twenty-day catgut, then divided and removed, the line of incision in it is $\frac{1}{4}$ inch above the basal ligature. The stump is then tied round and the cut edges overstitched inward. The long ends are then threaded respectively into a blunt-pointed hernia needle which is passed up the inguinal canal and made to transfix the layers of the abdominal wall $\frac{1}{2}$ inch apart and finally tied together on its anterior surface. The conjoined tendon is then fixed down beneath the under surface of Poupart's ligament by means of two mattress sutures; the round ligament is stitched to the upper surface of Poupart's ligament, and the pillars of the external abdominal ring are sutured closely together. A subcutaneous stitch unites the skin edges, and this completes the operation.

This operation differs from that of Macewen's in two respects: first, the skin incision is transverse and not oblique, and second, a part of the sac is removed. The slight trau-
matism produced by the passing of the stitches causes an organization between the two opposed sac surfaces, and thereby the continuity of the peritoneal peritoneum is completely restored.

Postoperative treatment consists in keeping the patient in bed for from 10 to 21 days. No dressing is required and there are no stitches to remove. Patients are advised not to resume heavy work earlier than 12 weeks from the date of the operation.

RESULTS

In this particular case and by means of this method, the result has been an excellent one. So far, there has been no recurrence. In this slight modification of Macewen's operation, I think it is possible that there can be no recurrence, in the true sense of the word, because the sac has been removed, and this I

consider the determining factor for the success of any hernia operation.

CONCLUSION

As a result of the investigation of this case, I find that the occurrence of inguinal hernia with the ovary as the only content of the sac is even more rare than a superficial glance at the literature would lead us to believe. After a very careful analysis of the literature, I believe that the correct number of cases recorded to date is 136, including Percival Pott's case 137, and including the present one 138. It is therefore, as I have said before, still uncommon enough to be regarded as a surgical curiosity.

The study of hernial conditions is interesting from every point of view, and I believe that further knowledge regarding the pathology will result in more benefit to the patient than the invention and elaboration of an endless variety of operations.

It was intended that this paper should be written in collaboration with Dr J. A. Clark, but unfortunately during its preparation he died. I have therefore undertaken the task alone, and I have been deprived of his criticism and originality of mind which were second to none.

Dr Dobbin, who kindly referred the case to me, has rendered valuable assistance in the preparation of this paper, and to him I record my grateful thanks.

BIBLIOGRAPHY

1. ABEL and McILROY: Textbook of Gynecology. Eden and Lockyer, 1916, p. 37.
2. ANDREW J. Am. M. Ass. 1905, xiv, 1613.
3. BARNES K.: On hernia of the ovary and observations on the physiology of the ovary with the relation of cases observed by the author. Am. J. Obst. 1883, xvi, 1-25.
4. BARNES H. A.: Case of hernia of the ovary in a child seven months of age. Brit. M. J. 1895, i, 1393.
5. BOYER A.: Traité de maladies chirurgicales, 3rd ed. Paris: Mignot, 1822, viii, 387-390.
6. CHENEVIX: Bull. et mém. Soc. de chir. de Par. 1850, xiv, 396.
7. DENEUX L. C.: Recherches sur la hernie de l'ovaire. Paris: Cabon, 1813.
8. DOYEN F.: Surgical Therapeutics, 1920.
9. IDEY T. W. and LOCKYER C.: Textbook of Gynecology, 1916, p. 643.
10. ENGLISH J.: Wien. med. Presse, 1868, 349-50, 373, 75, 420, 22, 451-53.
11. FARGUS: Note sur un cas de hernie inguinale bilatérale de l'ovaire droit avec gros cyste réticulaire de même organe. Arch. de Tocol. Paris, 1890, xvii, 767-68.
12. CURRIANT: Hernie de l'ovaire par le canal inguinal. Bull. Soc. de chir. de Par. 1851-2, ii, 127-131.
13. HAMILTON I. H.: Congenital inguinal hernia ovarian etc. Bellevue & Charing Cross Report, New York, 1870, p. 159-61.

- 14 HERZFELD, G. Edinburgh M J, 1925, xxii No 6
- 15 HUNTER and ROYLE
- 16 JUDD E S. Old Dominion J M & S Richmond
1913 xvi 153-156
- 17 KELLY H, and NOBLE C P. Gynaecology and
Abdominal Surgery, 1908
- 18 LANGTON. St Barth Hosp Rep Lond 1882
- 19 LOCKWOOD C B. Hernia of the ovary in an infant
with torsion of the pedicle. Brit M J 1896 i 1442
- 20 LOURAMINE L. Paris F Surg 1869
- 21 MACEWEN SIR WM. Ann Surg 1886 iii 89-119
- 22 MACFARLANE W D. Personal Communication
- 23 McLELLAN A. Glasgow M J 1923, cii March
- 24 MAYLARD A E. Practice and Problems of Abdominal
Surgery 1913
- 25 MENCIERE L. Rev mens de mal de l'enf Par
1897 xv 270-280
- 26 MENEGA. Dell ernia inguinale dell ovano Riforma
med Napoli 1894 x pt 1, 495-498 507-511
- 27 MOORE W J. Ann Surg 1922 p 31
- 28 Idem. Glasgow M J 1923 April
- 29 NEBOUY. Bull gen de therap Par 1843 xxviii
286-89
- 30 POOL E. Quoted by Erdman. Ann Surg 193 lxxvii
180
- 31 POTT PERCIVAL. Quoted by Sir J Y Simpson in
Acupressure
- 32 PUECH A. Nouvelles recherches sur les hernies de
l'ovaire. Ann de gynéc Par 1899 xi 401-430
- 33 SCHNITZLER J. Torcite Ovari hernie. Wien Klin
1903 xvii 793
- 34 SCHONMEIER A. Ueber Ovarialhernien. Beitr klin
Chir Tuebing 193 451-460
- 35 SIMPSON SIR J Y. Clinical Lectures on the diseases
of women. Philadelphia 1863 p 3,6
- 36 THOMAS L E. Inguinal hernia of the ovary. These
Par 1837
- 37 WATSON L F. Hernia. Kimpton and Company
London 1924
- 38 WIBAILLE. Des hernies de l'ovaire. These Par 1874

SUBUNGUAL EXOSTOSES

BY ARTHUR D. KURTZ, M.D., F.A.C.S., PHILADELPHIA

Associate Professor of Orthopedic Surgery, Temple University

FORTY TWO cases of this condition have been observed in the past 10 years, but in none of these cases had a correct diagnosis been made although the patients had been observed by capable men. This fact led to a survey of the literature and but 3 extensive references were found those of Paget (1), S. D. Gross (2) and Davidson (3). In most of the textbooks there is no reference made to the subject. This would seem a sufficient reason for again drawing attention to this rather painful and disabling condition.

A subungual exostosis is an outgrowth of new bone from the dorsum of the distal phalanx of a digit usually of the great toe. Paget states 'No adequate explanation I believe can be offered for the occurrence of these growths. They may sometimes be referred to injury yet the effects of injury to the great toe are so inconstant that we cannot refer to injury as other than an indirect cause of the growth of tumors so singularly constant as these are in all of their characters and so nearly without exception limited to the one of all that are exposed to injury. Exostoses grow almost always on the margin and usually on the inner margin of the end of the last phalanx of the great toe. In only one specimen have I seen such a tumor springing from the middle of the dorsal surface of the phalanx and in only two specimens similar tumors from the last phalanx of the little toe. Growing up from the margin they project under the edge of the nail, lifting it up and thinning the skin that covers them until they present an excoriated surface at the edge of the nail. Their growth is usually slow and when they have reached a diameter of $\frac{1}{4}$ to $\frac{1}{2}$ inch they commonly cease to grow and become completely osseous. They are among the tumors the independence of which is shown not only by abnormal growing but by the staying of their growth when they have attained a certain normal stature.' Most of these observations made three fourths of a century ago are as true today as then.

Gross tells us that "the last phalanx of the great toe is sometimes the seat of an exostosis so large as to cause serious inconvenience and pain in walking. It may appear at various points of the bone but generally it is seated at its inner margin partly under the nail which in time it lifts up and partially destroys by ulceration. Its form is spherical or pyramidal and its size varies from that of a millet seed to a hazel nut. Its structure and consistence resembling those of natural osseous tissue arising generally without any assignable cause. Its origin is usually ascribed to a blow or the pressure of a tight shoe. It is most common in young adults. It is slow in its progress is attended with more or less fetid discharge and is amenable to excision with a stout knife aided if necessary by the saw and gouge. Amputation of the phalanx is not to be thought of unless the whole bone nail and soft parts are involved in a destructive ulceration. A marked tendency to recurrence occasionally exists requiring further interference. For this reason an excision should always be performed with the greatest possible care. An exostosis sometimes forms on the small toes.'

ETIOLOGY

In reviewing our cases we found that 39 were seen in private practice and but 3 in dispensary practice. There were 3 times as many females as males. The ages varied from 6 years to 50 years the larger number occurring between the ages of 15 and 30 years. Antecedent trauma and by this is meant trauma directly related to the onset of the growth was given in a case in 18 cases. In 17 cases a history of long continued suppuration from ingrown nail was given, but this fact is not important in view of the symptomatology of the growth. In 2 cases both factors were said to be present. The most common traumatic injury was having the toe trodden upon during dancing or in crowded places or having weighty objects fall on the toe. In the young

est patient, aged 6 years, a direct connection was established between the trauma caused by a heavy individual treading on the toe and the growth. The child had not fully recovered from the disability of the contusion before the earliest symptoms of the growth were noted. It is evident from this analysis that trauma plays an important part in the causation of these growths, the role of antecedent infection not being clearly established.

PATHOLOGY

Exostoses in general are said to be either hereditary, infective, or traumatic in origin. The growth arises from the periosteum, beginning usually as an acute periostitis, later becoming subacute and then productive, going through the customary stages of bone production until bone is fully formed. Clinical experience shows that subungual exostoses follow this general course. In a case recently observed the growth had been present but one month and was soft. The exact nature of the growth was doubtful. The history was that of injury during dancing about 3 weeks before the tumor appeared. Other growths have been found to be cartilaginous, while still others have showed typical bone, the latter having been present over longer periods. From our records it has been impractical to set a definite time for ossification, though it evidently occurs between 6 and 18 months after the initial symptoms.

Due to their position under the nail, which no doubt exerts a certain amount of pressure upon them, these growths, except in the earliest stages, are likely to show a concavity in the phalanx, that is, they press into but do not grow into the phalanx. In proof of this we have found that when the tumor is removed at the normal level of the bone, it invariably recurs, whereas if it is peeled out of the bone leaving a cavity with some condensation of bone about it, it never recurs.

The site of origin is either on the inner side of the phalanx or in the midline. None have been observed on the outer half. In the anteroposterior axis, the usual site is about midway between the base and the free edge of the nail. The next most frequent site is well anterior, the least frequent, at the base.

In size they vary from about $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter. They are roughly cylindrical in outline, and tend to maintain a certain uniformity of shape until the free edge of the nail is reached, they then are likely to mushroom. The free portion of the tumor shows a tendency in the early stages to cornification, but this is soon replaced by destruction of the cornified tissue and ulceration.

SYMPTOMATOLOGY

In cases in which the growth begins well toward the anterior part of the nail, the first evidence is that of a pinkish growth varying in size, projecting beyond the free edge of the nail and accompanied by pain and tenderness particularly when there is shoe pressure. Early the surface is smooth, but later it develops a stratified appearance and still later ulcerates. The nail over the tumor is raised from its bed, the free edge increases posteriorly and shows a dark color with brittleness, and the nail finally breaks and shows a concavity in the free edge. The tumor, now free of restraint from overlying nail, grows upward above the nail level, so that the growth is now upward and anterior. At this point the pressure of the shoe becomes unbearable and the shoe is cut out over the growth. The patient limps, with a tendency to walk with the foot in eversion, taking off the step at the metatarsophalangeal joint instead of at the end of the great toe. With the ulceration, discharge, and pain it is easy to see how the condition may be confused with ingrown nail, but there is more of a tendency for the nail to be lifted out of the corner of its bed instead of growing into it.

When the growth begins at the middle of the nail, pain is the earliest symptom. The pressure of the nail on the tumor causes a convex elevation in the nail, the elevation proceeding anteriorly as the tumor enlarges.

When the tumor reaches the free edge of the nail, it develops as described previously. In most cases before the tumor has reached the free edge, the edge may be somewhat lifted and inspection discloses the pinkish tumor beneath it.

No accurate symptomatology can be given for growths beginning at the base of the nail, as no symptoms have been noted in the early

stages From histories it would seem that pain was noted first and then enlargement with color changes in the nail The cases that came under observation showed a tumor occupying varying sized portions of the inner side of the nail bed with destruction of the nail, immediately anterior to the growth the destruction extending the full length of the nail The following case shows an interesting variation from type

A male age 46 machinist white injured his toe 2 years before coming under observation Shortly after the injury the toe became quite painful a swelling appeared at the inner and lower angle of the nail and the inner quarter of the nail turned black, sealed off and was replaced by a softened dark material that resembled softened nail A fleshy, antenna now appeared at the dome of the tumor and grew forward until the end of the toe was reached This was free except at the base A surgeon was consulted who evidently not recognizing the underlying condition cut off the tendril and had quite a severe hemorrhage to deal with The patient was advised that he had a hemorrhagic tumor the removal of which would be dangerous The tendril began to grow almost immediately after the operation and a year later the patient came under my observation

There was a tumor about $\frac{3}{4}$ inch in diameter at the lower inner quarter of the nail Extending forward from the top of the tumor was a fleshy tendril over an inch long the inner quarter of the nail was dark and soft The fleshy tendril was destroyed by fulguration and the tumor removed afterward in the ordinary manner Six months later there was no recurrence the nail had reformed and looked well except for some slight ridging

DIAGNOSIS

The diagnosis can be made from the history the symptoms and the appearance of the toe In a few of our earlier cases roentgenograms were made but were soon found to be a source of error for if ossification had not occurred the findings were usually negative However if a roentgenogram is made the position should be lateral never dorso plantar From a differential standpoint the only condition that is likely to cause confusion is infected ingrown nail but the whole picture of the exostosis is so different from the ingrown nail that confusion hardly seems justifiable

TREATMENT

The treatment is operative The instruments required are a Record syringe with a short stout needle 1 per cent novocain solution nail clippers a stout chisel and gouge each about 4 inches long and $\frac{1}{4}$ inch wide a piece of rubber tubing to be used as a tourniquet, and a haemostat to be used in clamping the tubing

Operation Under the usual aseptic conditions the tube is placed about the base of the toe and clamped The nail is now blocked After blocking the nail we run the needle well under the growth from the front until the bone is reached and deposit what solution we may at that point The nail over the growth is now cut away either with the clippers or chisel until the full length of the growth is exposed The gouge is now passed beneath the growth from the front backward and downward until the phalanx is reached Now with a sweeping maneuver and with the gouge pressed backward, the growth may be peeled from its bed into the groove of the gouge The edges of the cavity are now trimmed the cavity is painted with pure phenol followed by alcohol and the tourniquet removed Oozing is the rule but can be controlled easily by pressure No severe bleeding has ever been witnessed Wet dressings are applied and the patient is instructed to rest the foot for 24 hours After that time the usual occupation may be resumed Granulation rapidly occurs and after 2 weeks the patient may be discharged from observation In several of the earlier cases the operation was performed under general anesthesia, the patient being kept in the hospital for 48 hours after the operation Later experience has shown such a course to be unnecessary

REFERENCES

- PAGET JAMES Surgical Pathology 1834 pp 461 and 462
GROSS SAMUEL D System of Surgery 5th ed 21 p 1043
DAVIDSON ARTHUR J Am J Orthop Sur 1916 xiv 150

PNEUMATIC RUPTURE OF THE BOWEL¹

By GEORGE L. HAYS M.D., F.A.C.S., PITTSBURGH

Senior Mercy Hospital, Assistant Professor of Surgery, University of Pittsburgh

PNEUMATIC rupture of the bowel is an uncommon and unusual accident. It dates after the time compressed air was first used in the industrial arts. Compressed air is now used in many manufacturing establishments for numerous and various purposes but principally for motive power.

Careful search of the literature by myself and also by the Department of Literary Research of the American College of Surgeons reveals the fact that up to the present time only 32 cases are recorded in the medical literature. No doubt many cases are never reported in the medical literature. In the daily press we see reports which are evidently cases of this type of injury.

G. W. Stone, of London reported the first case of this injury in 1904. E. Wallis Andrews of Chicago, in 1911 reported a case and reviewed 16 others, Bendixen and Blvthung reported their case and collected 7 others, Cotton, Buchbinder Hailes Schwartz Sparkman, each report a case and Jean reports 2 cases. All of the operative cases are recorded chronologically after the report of my case which follows.

S. K., male age 35 years was admitted to my service at Mercy Hospital March 3, 1923. On this date he had been working in a mill in a very dusty place. Upon quitting work he and a fellow workman were "dusting-off" their clothing with a compressed air hose which was under pressure of about 95 pounds. While this "dusting-off" was going on the fellow workman placed the nozzle of the air hose near the buttocks. It is not believed that he was trying to play a joke on him at this time. When the nozzle was placed near the buttocks the air passed through the anus into the intestinal canal. Immediately upon air entering the intestinal canal the patient stated that he had severe abdominal pain. The pain was so severe as to cause him to fall down but did not render him unconscious. The accident occurred at 5 p.m. He was admitted to Mercy Hospital at 5:30 p.m. where I saw him a few minutes afterward.

He complained of severe pain in the abdomen and presented the appearance of some shock. The pulse was a little weak and a little rapid. The blood pressure was 145—75. His respirations were if any but

little increased. There was tenderness over the entire abdomen and he stated that he had some pain in the epigastrium although on pressure in this region no pain was elicited. The abdomen was roundly distended and on palpation a more or less boardlike hardness was noted resembling that of a diffuse peritonitis. The distention could be plainly seen and there was a fullness in the flanks. This latter condition was quite noticeable. It was also noted that the inguinal canals were more prominent than normal. The usual navel depression was absent, it being level with the skin of the abdomen. There was marked tympany over the entire abdomen. The liver dullness was lost and the pericolic was absent. His leukocyte count at 6 p.m., 1 hour after the accident was 15,000. The diagnosis of pneumatic rupture of the intestine was made from the history together with the clinical symptoms and signs. He was taken to the operating room where with the help of my assistant Dr. J. H. Seipel the operation was begun at 6:50 p.m. 1 hour and 50 minutes after the accident. Intraspinal anesthesia was employed—sodium grains 15. Complete anesthesia was slow in coming on and it was 15 minutes before the operation could be started.

Operative pathology. There was a rupture or perforation involving all the coats of the bowel in the upper part of the rectum just distal to the ending of the sigmoid. The perforation was about 1 inch in diameter irregular in outline and on the antero-surface. Above this point in the sigmoid for a distance of about 8 inches the serosa was torn in several places exposing the muscular coat of the gut. In one or two places the separation of the serosa was 1 1/2 to 2 inches in breadth. The parietal peritoneum and the serosa of other intestines lying near the damaged bowel showed congestion. There were small particles of fecal matter in the region of the injury outside the intestine as well as a small quantity of blood in the pelvis. The abdominal cavity also contained large quantities of gas or free air.

A 7 inch incision was made through the rectus near the midline on the left side. As soon as the peritoneum was opened a large quantity of gas escaped. When this occurred his general condition at once improved for the reason that he was able to breathe easier. The perforation was closed by two rows of silk sutures. Before closing the perforation a rectal tube was inserted through the anus and made to pass beyond the opening in the bowel. This was performed so that gas and fecal matter could go through this tube and also to relieve possible pressure later at the suture line. The laceration of the serosa of the sigmoid was brought together by silk sutures. A cigarette drain was inserted down to the site of

¹ Read before the Fayette County Medical Society, Union, Pa., Pennsylvania January 7, 1924.

the perforation and the remainder of the abdominal incision closed. As we were fearful of an intestinal obstruction later the sigmoid was sutured to the peritoneum through a McBurney incision so that if necessary an opening into the bowel could be easily made. The operation consumed 1 hour and 10 minutes. He left the operating table in as good condition as he was in when he went on it.

His convalescence was rather stormy. There was considerable drainage of gas and fecal material for a few days through the rectal tube which had been inserted at the time of operation. This tube became displaced but even after this there was always some gas and fecal matter coming by the natural channel. Peristalsis returned to some extent within 24 hours. The first day after the operation on account of some distention it was decided to open the sigmoid where it was attached to the peritoneum. I found this rather difficult and was not certain whether the lumen of the sigmoid was opened or not. In any case no gas came through. The second day after operation on account of more distention a cecostomy was done. This was effective and the distention subsided. He developed some nausea and vomiting for which lavage was performed several times. Drainage from the cecostomy was not free until the fifth day following operation. By March 14, 9 days after the operation he was taking fluids by the mouth freely, the peritoneal symptoms had subsided and the danger of death from peritonitis had disappeared. Notwithstanding that he was apparently in better condition he went into a semistuporous and delirious state with a subnormal temperature. The cecostomy was draining very freely in fact any fluids which he took by mouth appeared to come through the cecostomy in a short time. I came to the conclusion that his poor condition was directly due to loss of fluids and food materials coming out through the cecostomy before any absorption could take place. On March 15 his general condition was worse. The cecostomy still drained freely and I decided that unless something could be done to stop the loss of fluids from it he would die in a short time. I consulted one of my medical friends about food which might be absorbed before it went as far as the cecum. He suggested that we stop the drainage from the cecostomy by using a self retaining catheter. The suggestion of stopping drainage was a new idea and met with my approval. I did not believe the self retaining catheter would do the work and finally thought of the Barnes dilator which is oarrow in the middle and bulbous on both ends and when blown up would remain in the bowel opening. This procedure acted well and stopped the drainage from the cecostomy. As soon as the drainage stopped his general condition at once showed a great improvement and he rapidly came back to normal. The original abdominal incision became infected and finally healed as did the incision for the cecostomy. A hernia developed in both incisions. He was readmitted to the hospital March 22, 1924 for the repair of the incisional hernia and also for the cecostomy

tomy incision which was repaired on May 10, 1924. He is in good condition at the present time and is working in the mill.

The Barnes bag solved the problem of stopping the drainage from the cecum and I am sure that without the use of it in this instance, death would have occurred. This was a new procedure in my experience and I believe it is of great value. In this connection smaller rubber bags of proper design could be made to fit almost any case of enterostomy and be of service provided that the rest of the alimentary tract is patulous.

OPERATIVE CASES

CASE 1. Stone (12). Operation performed probably 3 hours after accident. Two perforations of sigmoid were present. The operative procedure consisted of paracentesis abdominis. Death ensued 4½ hours after the accident.

CASE 2. Andrews (1). Patient was operated upon 5 hours after the accident. There were three perforations of the sigmoid and a laceration of the serosa and muscular coats of the gut. Resection of sigmoid was done with lateral anastomosis. Patient recovered.

CASE 3. Reported by Andrews (1). Patient was operated upon by Fletcher 4½ hours after the accident. A perforation of the sigmoid was found. The perforation was repaired and a cecostomy was done for obstruction with resection later. Patient recovered.

CASE 4. Reported by Andrews (1). The name of operator and the time of operation after the accident were not stated. The intestines were perforated and lacerated. Laprotomy was done but patient died.

CASE 5. Reported by Andrews (1). Operation was performed by Boughton many hours after the accident. There were three perforations of the sigmoid which were repaired and the patient recovered.

CASE 6. Reported by Andrews (1). Operation was performed by Stevens probably 10 hours after the accident. Perforation was present at the splenic flexure which was repaired. Patient died.

CASE 7. Reported by Andrews (1). Operation was performed by Sherman. The time of the operation after the accident is not stated. A perforation of the sigmoid was repaired. The patient died.

CASE 8. Reported by Andrews (1). Operation was performed by Kahle 18 hours after the accident. No perforation was found but there was a laceration of the serosa and the muscular coats of the gut. No air was present in the abdominal cavity. The lacerations of gut were repaired. Patient died.

CASE 9. Reported by Andrews (1). Operation was performed by Burry. Time of operation after the accident is not stated. There were three perforations of the colon repaired. Patient died.

CASE 10 Cotton (4) Operation was performed probably 3 hours after the accident. The ascending colon was perforated and the serosa and muscular coats were badly torn. Immediate colostomy was done at site of perforation and the lacerations repaired. Patient recovered.

CASE 11 Bendixen and Blything (2) Operation was done 2 hours after the accident. The transverse colon was perforated with laceration of the serosa and muscular coats of the large gut and laceration of the serosa of the terminal ileum and mesentery. The perforation and lacerations were repaired and the patient recovered.

CASE 12 Reported by Bendixen and Blything (2) The name of the operator is not stated. Laparotomy was done probably 2 hours after the accident and the bowel found ruptured. No further record is given. Patient died 3 hours after the accident.

CASE 13 Reported by Bendixen and Blything The name of the operator is not stated. Laparotomy was done 4 days after the accident. A perforation of the sigmoid was found. No further record is given. Patient died.

CASE 14 Reported by Bendixen and Blything (2) The name of operator and the time after accident before operation are not stated. Laparotomy disclosed a rupture of the bowel. No further record is given. Patient recovered.

CASE 15 Reported by Bendixen and Blything (2) Operation was performed by Groman. The length of time between operation and accident is not stated. The colon was perforated and its serosa and muscular coats lacerated. Operative technique consisted of paracentesis abdominis and repair of the perforation and laceration. Patient died.

CASE 16 Buchbinder (3) Operation was done probably 3 hours after the accident. A perforation of the sigmoid was repaired and the descending colon brought out for colostomy. Patient died.

CASE 17 Jean (6) Operation was done 4 hours after the accident. A perforation was found at the rectosigmoidal junction, with extensive laceration of serosa and muscular coats of rectum. The sigmoid and rectum were resected and an artificial anus was made. Patient recovered.

CASE 18 Jean (6) Operation was done 2½ hours after the accident. A perforation of the sigmoid with extensive laceration of the serosa and muscular coats of rectum and sigmoid was found. The sigmoid and rectum were resected, an artificial anus made and the patient recovered.

CASE 19 Hailes (5) Operation was done 19 hours after the accident, and disclosed a perforation of the colon. Laparotomy with drainage. Patient died.

CASE 20 Schwartz (9) Operation was done 6 hours after the accident. No perforation was found but the serosa and muscular coats of large gut were lacerated. The lacerations were repaired and appendicostomy done. Patient recovered.

CASE 21 Spirkman (10) Operation was done probably 3 hours after the accident, and disclosed a perforation of the sigmoid, with laceration of the

serosa and muscular coats. After paracentesis abdominis and repair of the perforation and laceration patient recovered.

CASE 22 Hays Operation was done 1 hour and 50 minutes after the accident. A perforation of the rectum and laceration of the serosa of sigmoid were repaired. Patient recovered.

The general mortality for the entire series regardless of treatment is 60.50 per cent. This mortality is high. The cause for this, I believe, is partly that many of them came to operation late or refused to permit operative interference. Two patients Case 14 reported in Andrew's paper and Case 2 reported by Bendixen and Blything recovered without operation. The symptoms in these two cases were those characteristic of the clinical picture in rupture of the bowel. In the operative cases, 22 in number, including the one just reported, there were 11 deaths, a mortality of 50 per cent. In the cases following operative interference, the ages in the recovery column range from 14 to 30 years with one not stated, and the deaths with four not stated, range from 15 to 47 years. The age incidence has but little bearing on the result in this short series. The time elapsing between the injury and the operative interference in all the operative cases was from 1 hour and 50 minutes to 4 days with the time not stated in six. In the eleven cases which recovered, the time elapsing between the injury and operative interference with one not stated and another of many hours, was from 1 hour and 50 minutes to 6 hours.

ETIOLOGY

The cause of the rupture of the bowel is the entrance of air under pressure into the intestinal canal by way of the anus. All authors who have written on this subject state that the conformation of the body in this region is such that the anus is the apex of a funnel, the overhanging buttocks, the posterior surface of the thighs and the perineum forming the sides of a cone. This is especially true if the patient is stooping over slightly or is in a sitting position. It is not necessary for the nozzle which is attached to the compressed air tube to be inserted in the anus. As a matter of fact the end of the nozzle is usually several inches or more away from the body. I have found only one case (Stone) in which

CLINICAL SURGERY

FROM THE SURGICAL CLINIC AT BERNE

THE OPERATIVE TREATMENT OF GOITER

BY DR F DEQUERVAUX, F.A.C.S. (Hon.) BERNE, SWITZERLAND

Professor of Surgery at the University of Berne

AND

GEORGE M. CURTIS, M.D.

Assistant to the Surgeon at the Clinic of Berne

FOR decades about one seventh of all the operations done in the Surgical Clinic at Berne have been for goiter. This fact permitted my predecessor Prof Theodor Kocher to participate as everyone knows in the improvement of the operation as a typical procedure. Although the operation had already reached a high degree of perfection at the end of the last century there still remained the possibility of further improvement. The adverse experiences resulting from total extirpation had led to an increased emphasis of the unilateral or hemisection of the goiter. The preservation first introduced by Kocher of a part of the posterior capsule with its attached layer of goitrous tissue afforded to be sure a great protection to the recurrent nerve and the parathyroids. The disadvantage of the unilateral operation—the troublesome outgrowth of the goiter already present on the opposite side—was not prevented and consequently there appeared a large number of false recurrences resulting simply from the continued growth of the goiter on the side not operated upon. Consideration of this fact directed the surgeon more and more to do a bilateral operation. If one wished to operate bilaterally however the recurrent nerve and the parathyroids had to be ever so carefully protected. At the same time care had to be taken that enough functioning thyroid tissue remained on both sides so that a functional insufficiency was not to be feared. In other words the procedure had to be so devised that in spite of the bilaterality it contained in itself only a minimum of danger.

Since 1910 we have sought to meet these different requirements through certain modifications of the customary technique and in that way have formulated the operative rules which at present are employed in our clinic.

When we speak of rules let it be realized from the beginning that the primary rule of goiter surgery is to operate not according to a formal plan but rather according to the anatomical peculiarities of the goiter, the age of the patient and the functional state of the thyroid as determined by clinical study. In fact goiter and goiter are not the same as Kocher has already pointed out. The treatment of a diffuse parenchymatous or colloid goiter is entirely different than that of a bilateral goiter consisting of single large nodules. The treatment of the latter in turn differs from that of a definitely unilateral solitary goitrous nodule. The indications also vary with the young and old and are different with hypothyroid and hyperthyroid patients.

In the presence of a diffuse goiter, which if well developed is as a rule a colloid goiter, both lobes and in all probability the isthmus must be decreased through resection. Whether this procedure is done during one or two sessions depends upon the size of the goiter and the resistance of the patient.

The same indications do not hold for a diffuse small nodular goiter which we designate as a "pudding" goiter in which the entire gland is transformed into a large conglomerate of small nodules mostly varying in size from scarcely that of a pea to a hazelnut. The ideal operation here is the horseshoe resection with avoidance of the posterior surfaces of both lobes and isthmus and subsequent restoration of the lobes by suture of the tissue composing the remaining posterior surfaces.

If the goiter consists of a small number of large nodules these must all be removed by enucleation or resection enucleation. Only in aged patients weak in spite of their apparent health do we confine ourselves to the removal of those

nodules which compress the trachea most, and which usually lie in the region of the aperture of the thorax

In a less frequent number of cases with unilateral nodules, a unilateral enucleation or enucleation resection is indicated. This procedure becomes a hemithyroidectomy if the nodule, through pressure, has destroyed the entire lobe.

From these brief remarks it follows that in goitrous countries with severe endemic goiter the problem is technically more complicated than in regions where only a diffuse colloid struma of a moderate grade occurs and where the operation can so to say, be stereotyped into the resection of both lobes.

The ordinary course of the operation is as follows:

Local anaesthesia with rare exceptions is employed: one half per cent novocain containing 8 drops of adrenalin 1:1000 per 100 cubic centimeters being used. Instead of the paravertebral anaesthesia of the second to fourth roots of the brachial plexus for several years now we have employed little more than the subcutaneous injection of the field of incision, combined with perithyroid injection, in which the posterior surface of the struma is avoided as much as possible.

As a skin incision the collar incision is employed. This, if made at the correct height, suffices for all benign cases. On the aesthetic side it should be noted that the scar sinks lower in the course of time. Consequently it is necessary to make the incision somewhat above the clavicle if one desires later a correct position for the scar.

As a rule we begin the operation, after cutting through the skin and the platysma and ligating the superficial veins, by a unilateral or bilateral ligation of the inferior thyroid artery outside of the small muscles but within their external fascia, according to the method published in *SURGICAL GYNECOLOGY AND OBSTETRICS* in 1916.¹ The principles underlying this ligation have already been separately considered in that work. They are not understood by many surgeons who see only small goiters with modest arteries. He, however who works in a field of severe endemic goiter where the caliber of the thyroid arteries reaches 10 to 12 millimeters, with a corresponding caliber to the veins realizes how to value the advantage of a preliminary haemostasis. The objections which have been expressed against this procedure are confined mainly to the blood supply of the parathyroids. They show how fruitless it is to do surgery on paper. How unauthorized is the fear that one may produce

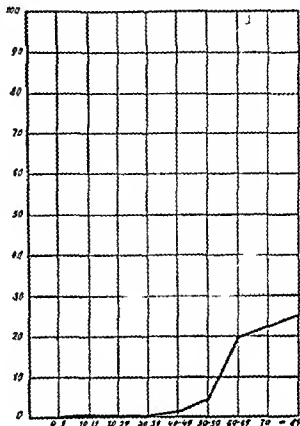


Fig. 1. Chart showing mortality percentage in goiter operations not including Basedow's disease malignant goiter and strumitis. Perpendicular lines represent ages horizontal lines percentage.

tetany through the bilateral ligation of the inferior thyroid arteries is shown by the subsequent clinical findings. These facts reveal that in about 2,800 goiter operations, only once has a slight tetany been observed, and that more over in a gravid patient. In a very few cases, not more than four as far as we can judge, a transient Chvostek or Trousseau sign has been elicited, lasting however, but a few days and unaccompanied by the peculiar signs of tetany. Also our statistics in relation to the protection of the parathyroids are better than possibly any other series of published observations in the literature.

Subsequent to the last 150 successive goiter operations in the clinic, a systematic search has been made for evidences of parathyroid insufficiency as manifested by increased nerve irritability and tetany. The patients have been observed daily and controlled by frequent attempts to elicit the Chvostek and Trousseau signs. In but one case was there definite evidence of increased nerve irritability—and that mild and transient. Both signs remained positive through the third day following the operation, during this time there was also some evidence in the characteristic

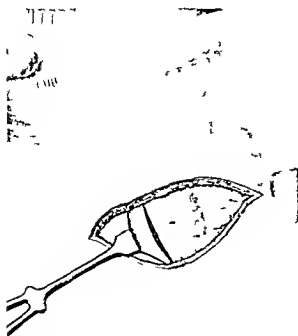


Fig. 2 Skin and platysma incised. The sternocleidomastoid muscle has been retracted outward. The external fascia of the small muscles is vertically incised over the sternohyoid muscle.

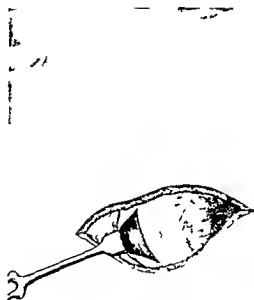


Fig. 3 Small retractor in position. The sternohyoid muscle is exposed. The forefinger will now be deeply insinuated in a median direction to seek and expose the inferior thyroid artery.

position of the hands. On the fourth day all signs were absent and the patient left the hospital on the eighth day in normal condition. A more complete account of this study will be presented later.

The underlying principle which we have already referred to in our earlier works since 1912 is a simple one. After ligation of both inferior thyroid arteries, indeed after simultaneous ligation of both superiors, (which moreover is only undertaken in exceptional cases) there is much less interference with the blood supply of the parathyroids than through loosening the goiter from its deep position in relation to the posterior capsule and denuding the trachea. By leaving the posterior surface of the thyroid lobe as much as possible in continuity with the deep cervical fascia the œsophagus and trachea, and exposing the latter nowhere extensively, we preserve to the parathyroids their rich collateral supply from the pharyngeal, laryngeal and tracheal arteries, thereby avoiding tetany more surely than by possibly any other method of operation. It therefore follows that those who designate the bilateral ligation of the inferior thyroid arteries as "unsound surgery" are unaware either of the anatomical unity of the blood supply of the parathyroids or of the statistical data.

A cursory examination of the blood supply of the thyroid region in the cadaver or in various anatomical texts and atlases gives no adequate idea of the numerous anastomoses between the thyroid arteries, especially the inferior and those of the larynx, trachea, pharynx and œsophagus. Such anastomoses are shown to advantage by special injections of the thyroid region made with a pressure apparatus. In cadavers so injected a series of anastomotic arterial arcades is formed along the pharynx, œsophagus and larynx, trachea with their enclosing divisions of the deep cervical fascia by successive branches from the aorta, the thyrocervical axis, inferior thyroid arteries, superior thyroids and hyoid branches of the lingual arteries. A study of these normally occurring communications reveals the ready facility existing for the establishing of a collateral supply to the parathyroids even after the ligation of the four main supplying trunks. Dr. Curtis in our clinic, is making an anatomical study of this question and will communicate his results at a later date.

We abandon of course the preventive ligation of the inferior arteries previous to dislodging the goiter if this so covers the arteries that they are not accessible without difficulties. Such cases,

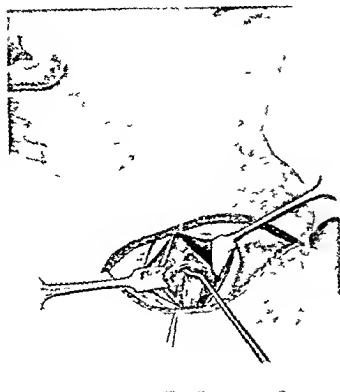


Fig. 4. A larger sized retractor has now been inserted. The inferior thyroid artery has been bluntly disengaged from its surroundings and will now be ligated.

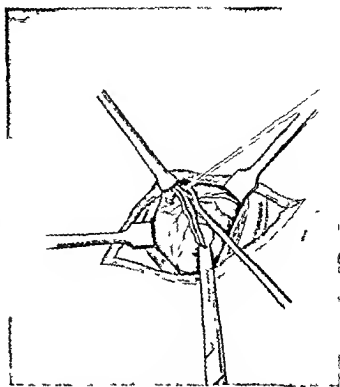


Fig. 5. Spatium sternohyoideum is dissected and access is now obtained somewhat more medially through the small muscles and the thyroid fascia immediately in front of the thyroid gland (in the spatium thyroideum). The goiter is retracted downward before luxating it in order to ligate the superior thyroid artery or its anterior branch.

however, are infrequent in our goiter material and the ligature is impossible from such causes, or from abscence of the inferior artery in only about 5 per cent of the cases, previous to the luxation of the goiter.

The second step of the operation is the exposure of the goiter itself inside the perithyroid space, and the ligature of the anterior or anterior and medial branches of the superior thyroids. The side on which to begin in a bilateral goiter is only safely decided from the X ray pictures. One always begins on that side where the greater, and especially the deeper, underlying compression is located. Only with large and especially greatly vascularized goiters, and in the case of Basedow-goiter, do we ligate also the entire trunk of the superior artery together with the veins, at least on the side most involved as a so-called upper polar ligature. Indeed, according to the circumstances the lobe under consideration is luxated before or after the ligation of the superior pole, and the most important veins about it are ligated. Especially to be considered are the veins of the lower pole and those in the angle between the lobe and the borders of the isthmus. Moreover, at the lower pole is frequently found the *arteria ima* and at the upper border of the isthmus a communicating branch from the superior artery

of the opposite side. It is helpful in certain cases to pull the goiter forward with heavy thread passed through its substance two or three times, or with cupped forceps.

Then according to its constitution, the goiter is resected enucleated or decreased in size by the combined procedures always preserving the continuity of its posterior surface with the deep cervical fascia and trachea. Thanks to the preventive ligature of the inferior arteries the bleeding in the sphere of the posterior capsule is at most unimportant, and but few forceps are necessary to control it. Definitive haemostasis is now achieved by ligatures and finally the edges of the lobe are sewed together with fine catgut, the result being the reformation of a lobe of approximately normal size. If the goiter is bilateral the procedure is similar for the opposite side.

If the isthmus is not enlarged or but little it is left intact. If it is greatly enlarged it is likewise reduced in size by enucleation or resection in such a manner, however, that a layer of thyroid tissue still covers the trachea. The preservation of the posterior portion of the isthmus is indeed important, since by so doing one aids in assuring the collateral supply of the parathyroids. In addi-

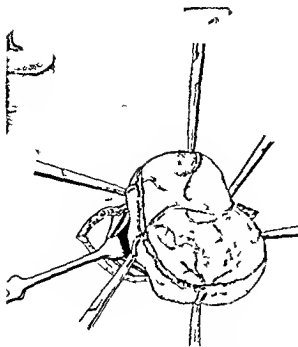


Fig. 6. Goiter luxated. Clamps are applied to the larger veins. The portion to be resected is shown by a circular incision.

tion the isthmus aids in giving to the neck its normal contour. If the isthmus is removed the jugular notch sinks deeply between the attachments of the sternomastoids, and there appears as a result an unsightly furrow, from which one recognizes that too much isthmus has been sacrificed. If the lateral lobes and isthmus form together a wide continuous mass, one proceeds best after a transverse resection of the small muscles with a horseshoe resection of the entire gland.

In all other cases the small muscles are not divided transversely, and the corresponding thyroid lobe is exposed by separating the fibers on either side, the muscles being cut only so much as is necessary to deliver the goiter.

After the removal of the goiter the patient is asked to strain in order to determine whether the veins are all safely ligated. If the entire field is dry, the small muscles are sutured with catgut and a glass drain is inserted. The incision is partially closed by two interrupted sutures, one on either side of the glass drain, and then completely with Michel's clips. As a protection a waterproof bib is fastened to the chin with adhesive, and hangs down over the dressing.

The platysma is cut through at the same level as the skin and the subcutaneous tissue and remains in contact with the latter. For this reason we

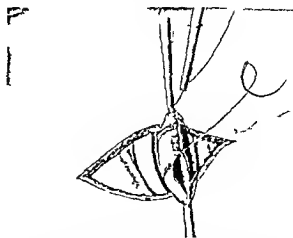


Fig. 7. Goiter removed by means of resection, enucleation, or combination of both. The larger veins and the anterior branch of the superior thyroid artery are ligated. The smaller veins have been drawn into the hemostatic suture. A lobe of almost normal size has been formed out of the remaining gland tissue.

have long abandoned suturing the platysma at the end of the operation. The less the skin layer is detached from the underlying tissues, the less the displacement in the platysma, and suturing will therefore be unnecessary. This feature has been controlled by the examination of 250 cases in which there was no separate suture of the platysma. No diminution whatever of the aesthetic result followed this deliberate simplification of closing the wound.

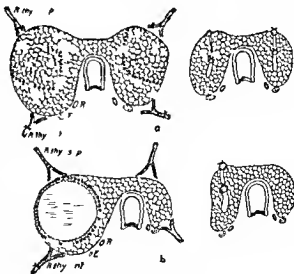


Fig. 8. Plan of goiter operation. a, Resection of both lobes. b, One-sided enucleation. c, Recurrent nerve. d, Epithelial bodies.

The drain is removed in from 8 to 24 hours, depending upon the amount of drainage, the Michel's clips are removed after 48 hours, and the two interrupted linen sutures at 5 days. The patient leaves the clinic a week after operation.

This is the ordinary course of affairs. Exceptional cases, especially struma intrathoracica and struma maligna, demand from time to time special measures, into which we cannot go in this brief article. They are described in our book on goiter.

In the case of Basedow goiter we ligate the upper pole on one or both sides, at a first session in severe cases, and leave the diminution of the lobes to a later session. The strumectomy is effected by enucleation resection in the case of toxic adenomata and by resection in the case of genuine exophthalmic goiter, occasionally, indeed, at two subsequent sessions. The determination of the operative procedure is governed by the entire clinical picture and the basal metabolism which is determined in all cases of hyperthyroidism. We have tried the preliminary iodine treatment in genuine Basedow cases with success, on the contrary we hold it as dangerous in toxic adenomata, more so as the majority of our toxic adenomata have arisen subsequent to the iodine treatment of an ordinary struma nodosa.

In cases of cretinism and hypothyroidism, on which we must operate in spite of insufficient thyroid function, on account of the compression symptoms, we leave, if possible, a considerable part of the goiter unmolested, as in the case of glands with normal function.

Preventive after treatment with iodine, as a prophylaxis against recurrence, we hold to be useful in the case of patients before the thirtieth year. With older patients we avoid it, and content ourselves with recommending the consumption of iodine containing salt (5 milligrams to a kilo). Finally, as to the mortality of goiter operations per se, not including Basedow goiter, struma maligna or strumitis, we have shown in an appended curve that this depends above all upon the age of the patient. Indeed, the more patients there are under 40, the more favorable will the statistics be and vice versa. It is a matter of individual experience with the individual surgeon to know how far he may go in his efforts to free patients, the more they are over 40, from their respiratory symptoms. Especially, however, must he convince himself by careful clinical study that the dyspnoea really comes from the goiter and not from other deep lying disturbances of the circulatory or respiratory organs.

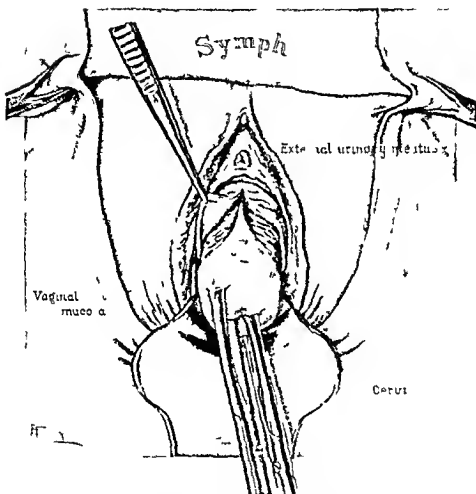


Fig. 1. Primary pear shaped incision for vaginal hysterectomy.

FROM THE MAYO CLINIC

TECHNIQUE OF THE MAYO OPERATION FOR CYSTOCELE¹

BY JAMES C. MASSON, M.B. (TOR.) F.A.C.S., ROCHESTER, MINNESOTA

Division of Surgery Mayo Clinic

THE Mayo operation for cystocele is especially indicated for patients close to or past the menopause if the cystocele is large (Grade 2 or 3) and if there is a prolapse of the uterus graded 2. With less prolapse (one should not be misled by an elongated cervix) there will be some difficulty in approximating the broad ligaments without undue tension, and if there is more downward displacement, sufficient support will not be obtained for the bladder without much shortening of the vagina.

The first step in the operation (Fig. 1) is to separate the bladder freely from the anterior vaginal wall and to cut the vaginal mucous membrane completely around the cervix. Attempts to define definitely the torn edges of the uteropubic fascia are a waste of time as this structure has retracted close to the pubic ramus. A small opening is cut in the peritoneum close to its reflection from the anterior surface of the uterus, and the uterus delivered through this opening in a position of extreme antero-flexion, an opening is then made through the posterior fornix into the peritoneal cavity. Clamps are placed on the broad, round, and uterosacral ligaments (Fig. 2), and the uterus is removed. The broad ligament can now be approximated and firmly stitched together, first by a continuous mattress suture and then by a running lock stitch (Fig. 3). This makes a firm sling or hammock with the cut edges and severed blood vessels turned downward into the vagina where they can be easily seen and controlled if any bleeding occurs.

The next step which is the most important in the operation consists in the anchoring of the upper part of the newly made support for the bladder close under the symphysis, leaving just sufficient room for the urethra (Fig. 4). This is best accomplished by stitching through the full thickness of the vaginal wall close to the ramus of the pubis on one side getting a firm bite with the suture in the ligaments just above the approximating running mattress stitch, and out through the tissue of the anterior vaginal wall close up to the ramus on the other side. The stitch is then made to retrace its course as a mattress stitch. The bladder is replaced above the approx-

imated ligaments and the suture tied, care being taken not to strangulate the tissues. If this stitch holds, there will be no more cystocele. If the bladder has been sufficiently freed there will be no danger of injuring it or the ureters. The operation on the anterior vaginal wall is completed by firmly stitching the everted edges of the ligaments into the whole length of the anterior vaginal wall and by approximating the vaginal mucous membrane with several figure of eight stitches (Fig. 5).

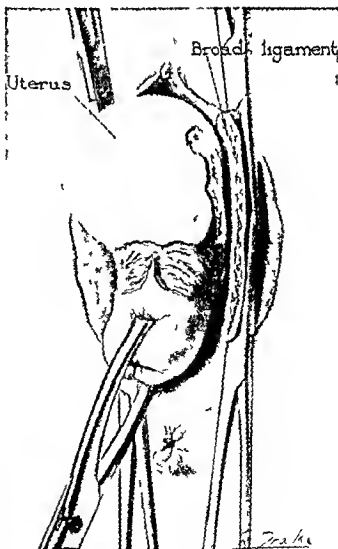


Fig. 2 Cutting the broad ligament

FROM THE SURGICAL CLINIC JOHNS HOPKINS UNIVERSITY

THE FINNEY PYLOROPLASTY

BY J M T FINNEY JR MD BALTIMORE

THE operation of pyloroplasty was first reported in a paper read by Dr Finney Sr before the American Surgical Association in 190. During the intervening period the originator and his associates have had ample time and opportunity to observe its advantages as well as its defects to determine its indications and its contra indications to develop such modifications as may have appeared to be desirable in order to obviate technical difficulties and to determine end results both good and bad.

Like every other operation it has its limitations. It is not applicable to every case. We believe that much of the criticism which has been leveled at it has been due to the fact that the operation has at times been pushed beyond its limitation. We believe however that when employed only in the cases which are adaptable to its use it will be followed by most excellent end results that it is not difficult of execution and in certain conditions it is preferable to any other type of operation. Briefly the chief indications for the operation of pyloroplasty are (1) benign stricture from whatever cause at or near the pylorus (2) the excision of ulcers duodenal or gastric at or near the pylorus (3) pylorospasm. The chief contra indications are (1) the presence of malignant disease, (2) the inability of the surgeon satisfactorily to mobilize the duodenum (3) benign lesions at a distance from the pylorus. In the presence of dense scar tissue formation and adhesions when the duodenum and pylorus have become firmly attached to the surrounding structures it will be found at times absolutely impossible to mobilize the pylorus sufficiently to perform the operation successfully. There are times when an anomalous anatomical arrangement or undue fixation of the duodenum makes the freeing of this organ unwise or even impossible. Especially is this true when it is tucked high up under the edge of the liver. Under such conditions, if one succeeds, by pulling the stomach over to the duodenum rather than the duodenum to the stomach in effecting a makeshift pyloroplasty under great tension one need not be surprised when the results prove unsatisfactory. If however, the operator is first careful thoroughly to mobilize the duodenum, and by this mobilization,

to render the structures easy of approximation *without tension* then he can be reasonably sure of a good functional result. This process of mobilization seems to be insufficiently understood and it is we believe upon the failure to grasp this principle and to carry it through that most of the criticisms of the operation are based.

When one is dealing with dense scar tissue or extensive adhesions about the pylorus and duodenum one must naturally be careful of these and the vital structures that may be involved namely the common duct colon and pancreas injury to any one of which may give rise to unpleasant complications.

All of our stomach cases are prepared for operation by a certain definite routine pre operative treatment based upon observations made both clinically and in the laboratory over a period of years. First of all as this operation is particularly applicable in cases which show a certain amount of pyloric stenosis with consequent gastric retention we employ periodic lavage in an attempt to render the operative field as clean as possible. The patient is usually kept in the hospital for 3 or 4 days before the operation and at least once a day during this period is given sterile lavage the final washing out being given just before going to the operating room on the day of operation care being taken to empty the stomach completely. During this time food is restricted to a sterile liquid diet. Antiseptic mouth washes may be employed but we have come to doubt their efficacy. It is our conviction that a stomach the secretions of which show free hydrochloric acid (most cases of duodenal ulcer show a hyper acidity) will sterilize itself within 24 to 36 hours if the patient is kept on a sterile liquid diet. This has been proved to our satisfaction from time to time by cultures taken from both the stomach and duodenum at the time of operation.

If there is anemia due to hæmorrhage, this condition should be remedied by transfusion before any operative procedure is undertaken. We feel that a hæmoglobin of 50 per cent is a low limit except in cases which offer some degree of emergency. If the degree of stenosis is such that there is evidence of dehydration or marked emaciation it is well to remedy this by infusion

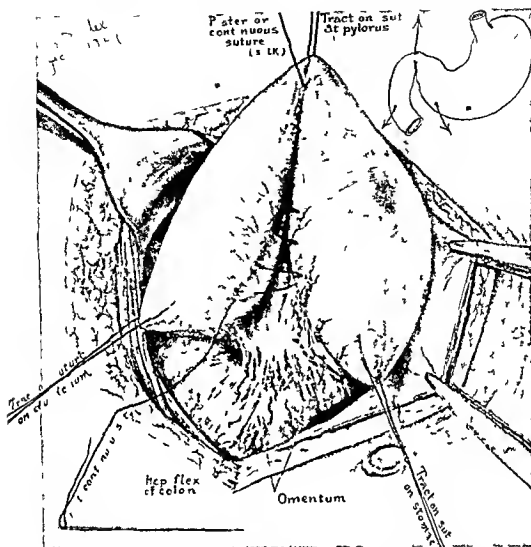


Fig 1 Showing traction stitches in pylorus, stomach and duodenum Posterior line of sutures nearly completed¹

Murphy drip, or nutrient enemata, thereby getting the patient into the best possible condition to withstand the operation.

The abdomen is opened by a right rectus incision, and the anatomical condition and the extent and nature of the pathology present are first determined by a thorough exploratory examination. If a pyloroplasty is decided upon, the typical procedure is as follows: the superior margin of the duodenum just beyond the pylorus, and occasionally including it, is freed from any adhesions or the veil like supporting ligament which runs to the under surface of the liver. This is done by a small incision along the duodenal margin, followed by peeling out the duodenum bluntly with the fingers, aided at times with gauze or rarely by sharp dissection. In this way practically the whole of the first and second, and even, if necessary, a part of the third portions of the duodenum may be readily mobilized with a

minimal amount of bleeding. This is rendered possible by the anatomical location of the blood supply of the duodenum, which is derived from behind and below. It is for this reason that the blood supply of the duodenum is not seriously interfered with by the process of mobilization. Emphasis should be placed upon the fact, not sufficiently recognized by some critics of the operation, namely, that upon the satisfactory mobilization of the duodenum more than upon any other factor depend both the ease of performance and the success of the operation. After the duodenum and pylorus have been thoroughly freed, three guide sutures are placed in the intestinal walls for use as retractors, one at the upper margin of the pylorus, one in the wall of the stomach close to the gastrocolic omentum and about 3 inches from the pylorus, on the greater curvature, the other

¹The illustrations used are taken from *Gynecology and Abdominal Surgery* by Kelly and Noble Philadelphia W. B. Saunders Co

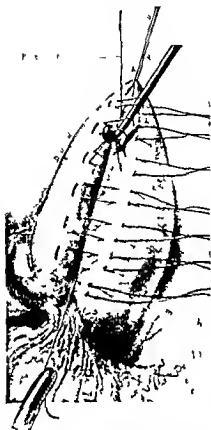


Fig. 2. Posterior continuous suture placed and tied. Ends left long as retractors. Anterior row of mattress sutures placed but not tied.

along the free border of the duodenum and a corresponding distance distal to the pylorus. By approximating these last two guides with slight traction downward and supporting the pylorus by like traction upward on the one first placed the walls of the stomach and duodenum are approximated for the placing of the posterior suture. This is of fine black silk or catgut if preferred and is usually easiest placed with a fine curved intestinal needle. The suture which we commonly employ is a simple running continuous suture, inserted well back toward the vessels of the greater curvature of the stomach and the mesentery of the duodenum. When this stitch has been satisfactorily placed it will leave about three quarters of the circumference of the duodenum for the placing of the mattress sutures.

The mattress sutures also of fine black silk, are then inserted starting from the lower end of the posterior suture just described and overlapping it a bit so as effectually to seal this angle. The mattress sutures are laid far enough out so as to in-

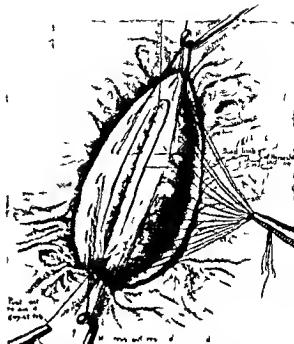


Fig. 3. Anterior mattress sutures retracted. Incision completed through the anterior gastric and duodenal walls.

clude any ulcer which may be situated on the anterior or upper portion of the duodenum and allow of its excision later. These mattress sutures are next loosened and retracted one half downward the other half upward in the same way. In this manner they are held well out of the operative field. The reason for placing the anterior row of stitches before opening the stomach and duodenum is that they can be placed just where you want them so much more satisfactorily before making the incisions in the stomach and duodenal walls respectively than afterward.

The general abdominal cavity is now thoroughly packed off from the region of operation before making the incisions into stomach and bowel.

Beginning from below, on the stomach side, and being careful to include all layers of the stomach we carry the incision upward in the stomach wall to and through the pylorus around into the duodenum in the shape of an inverted U and descend to a point opposite the starting point of the incision in the stomach. This will give, approximately, a 2.5 inch incision in the anterior wall of each viscus. If there is an ulcer on the anterior or superior portion of the pylorus or duodenum it should be excised ample room having been allowed for this



Fig 4 Anterior gastric and duodenal wall retracted showing buttonhole suture of catgut partly placed in the free borders of the posterior walls

in placing the mattress sutures, as stated above. If the ulcer is situated on the posterior wall of the duodenum at or close to the pylorus, it will be somewhat more difficult of excision. But this can be readily accomplished by removing a triangular piece of the duodenal wall (including the pylorus or not, as desired) apex downward toward the posterior suture. If such a procedure is necessary, we complete the closure of the defect in the posterior wall so made, before that of the pyloroplasty proper. A running suture of No. 2 plain catgut is started at the point from which the apex of the triangular piece was removed, and the mucosa of the stomach and duodenum are brought together by this means. We find it advisable to use a buttonhole suture for this, as it adapts itself best to the conditions. The duodenum is then retracted downward, and a continuous silk reinforcing suture is placed in the serous surface running upward and over the superior curvature as it is reconstructed. When these two sutures are completed we have returned to the *status quo ante*.

Looking through the incisions in the anterior walls, into the opened stomach and duodenum, we start a catgut suture at the lower angle posteriorly and make a continuous through and through buttonhole stitch, approximating the cut edges of the mucous membrane of the stomach and duodenum. This should give a very smooth,

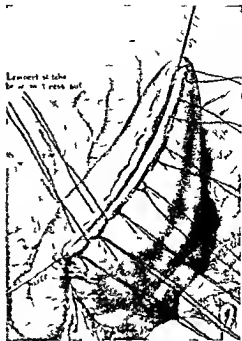


Fig 5 Mattress sutures previously placed now tied. Alternate Lembert sutures placed between the mattress sutures

good closure of the posterior wall and also control all bleeding. The bleeding points of the anterior wall of both stomach and duodenum should be individually clamped and ligated with catgut. Sometimes at the upper angle of the posterior suture line just placed, where the fibers of the pyloric sphincter have been cut across, there may be quite a redundancy of tissue. If this seems excessive, it may be trimmed off, and the cut edges approximated with a suture. However, we have found experimentally on dogs and in stomachs opened for one reason or another, that even when there has been left an apparent excess of tissue at this point, it will quickly disappear.

We have now a posterior wall which is held solidly by a serous continuous suture of silk and a mucosal continuous suture of catgut. The posterior line having been completed, and all bleeding on the anterior surface checked, the mattress sutures previously laid are drawn taut and tied. As a safeguard Lembert sutures of fine black silk are placed between each pair of mattress sutures on the anterior and superior surface. This completes the anastomosis with a double suture line throughout, continuous posteriorly, and interrupted anteriorly. We use the omentum to reinforce the suture line bringing it upward and tucking it well up in the angle between the under surface of the liver and the superior portion of the duodenum, so that if any adhesions are formed, they will be between movable structures.

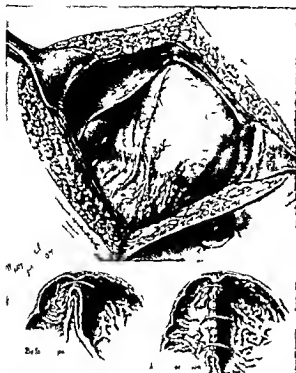


Fig 6 Operation completed showing relative sizes of old and new pylorus

The postoperative care is important. Subpectoral hypodermoclysis is usually given immediately upon the return from the operating room—about 1 500 to 2 000 cubic centimeters of normal salt. A Murphy drip containing a small quantity of soda bicarbonate and glucose is also instituted immediately if the patient is dehydrated. The bed is kept in medium Fowler's position. Very small quantities of crushed ice are given by mouth during the first 12 hours when water in dram amounts every hour is begun gradually being increased to 2 ounces every hour by the fourth day. The infusion is repeated on the second and even the third day if the patient complains much of thirst or if his condition in any way seems to indicate it. This depends to a great extent on his ability to absorb the Murphy drip. On the fourth day the first nourishment by mouth is given consisting of a dram of plain unflavored egg albumen alternating every hour with a dram of not highly seasoned concentrated meat broth. These amounts are gradually increased until by the seventh day the patient is getting 3 ounces of nourishment every hour alternating on the half hour with water if desired. If there is any tendency for the stomach to fill up as evidenced by a feeling of fullness with possible hiccoughs, regurgitation or active nausea the amount of fluid is immediately reduced and if necessary lavage is given. This is seldom necessary. We sometimes fall back on a dry diet from which fluids are eliminated in so far as possible and the patient is given thick cereals dry toast crackers, etc. By the tenth day he is usually on the routine hospital soft diet and at the end of 2 weeks on a somewhat lighter diet the principal restriction being on coarse meats and tough fibered vegetables together with highly seasoned foodstuffs of any sort. Recently we have in a number of cases passed a duodenal tube into the stomach the morning of the operation and at the time of operation following the completion of the anastomosis have drawn the lower end of the tube through the new ostium 4 to 5 inches down into the duodenum and left it there. Through this tube instead of by rectum we institute the administration of fluids in a manner analogous to the Murphy drip but with the added advantage that food may be given more rapidly the absorption is more complete and the consequent benefit to the patient greater also in cases of marked emaciation liquid nourishment can be introduced in this manner before the patient otherwise would be in a position to take it. We find that the patients do not complain excessively of the presence of the tube and they have in several instances left it in place for 5 or 6 days when they are able to take by mouth anything necessary without injury to the site of operation.

The bowels are not moved for the first 4 or 5 days. Enemata are given only as indicated by postoperative flatulence. Patients are usually allowed up in a chair about the twelfth or fourteenth day to walk about the sixteenth day and leave the hospital within 3 weeks of operation.

We have never had a case of postoperative hemorrhage. If any tendency develops toward dilatation of the stomach with gas or fluids the administration of the latter should immediately be suspended and periodic gastric lavage instituted. The irritation of the passage of the stomach tube will as a rule speedily stimulate the sluggish gastric musculature to normal peristalsis.

SUMMARY

Pyloroplasty is not difficult it can be done in most cases of pyloric and duodenal ulcer the one step on which hinges the ease and satisfaction of the performance is the thorough mobilization of the duodenum. This operation is the nearest approach to the reestablishment of the normal anatomical physiological relationship of the structures involved, and therefore the results obtained are better than those obtained by other methods.

AMPUTATION OF THE CERVIX WITH APPLICATION OF THE STURMDORF FLAP PRINCIPLE

By RICHARD W. TELINDE M.D. BALTIMORE

From the Gynecological Department of the Johns Hopkins Hospital and University

IT is not the purpose of this short article to discuss the indications for the various operative procedures upon the cervix. Amputation of the cervix is an operation which in the past has been used and abused. To my mind there is a selected group of cases in which the operation is definitely indicated as the operation of choice. These are essentially cases in which there is marked laceration usually accompanied by infection of the cervix in women near or after the menopause, when the question of child bearing may be left out of consideration. One also sees cases with marked elongation of the cervix which require operative treatment, often combining amputation with some type of uterine suspension for the complete relief of the patient.

Everyone who has had an extensive experience in cervical operations of the usual type is acquainted with the relative frequency of postoperative cervical hemorrhage and the difficulty in con-

trolling this at times. The hemorrhage occurs usually from 7 to 10 days after the operation at the time that the catgut begins to give away. The bleeding is usually controlled with some difficulty by resuturing the friable, vascular postoperative cervix, and healing after such a secondary operation is tardy and usually complicated by infection.

In 1916 Sturmdorf published his method of tracheloplasty. His operation is not a cervical amputation and indeed one of its chief virtues lies in the fact that it is not an amputation. Hence he advocates it as the operation of choice in the childbearing period. The operation consists essentially in coring out the infected gland-bearing tissue lining the cervical canal and relining the canal with a flap of mucous membrane dissected free from the vaginal portion of the cervix. The cervical musculature is, for the most part, left intact for function in subsequent pregnancies. An advantage offered by his operation over the simple trachelorrhaphy is that it removes and does not simply invert the infected glands lining the cervical canal. This it

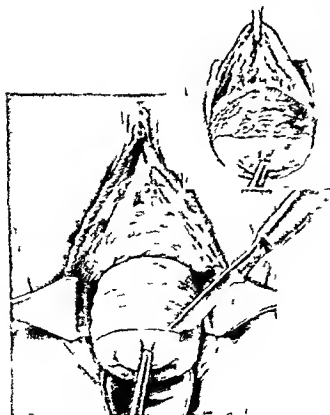


Fig 1 Amputation of the cervix.

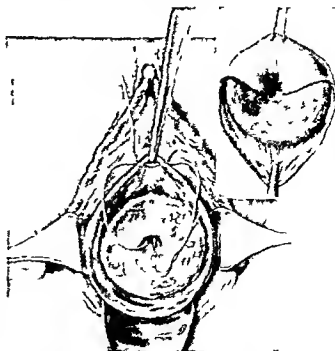


Fig 2 Suturing the stump

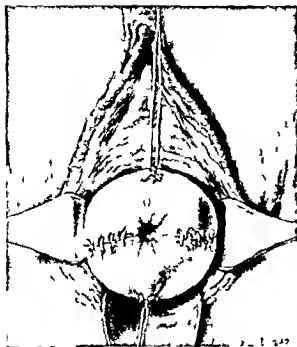


Fig 3 Operation completed

does effectively in proportion to the thoroughness with which the coring out is done. Another advantage of it over most types of cervical operations especially amputation is its complete covering of the newly formed cervical canal with a flap of mucous membrane which heals readily to the raw surface so that in 7 to 10 days when the catgut becomes weakened the flap has already healed over the raw area doing away with the chance for the late hemorrhage. It is this feature which has led me to apply this principle to cervical amputation.

The technique of the amputation is as follows. The operation is carried out more readily if the cervical canal is first dilated before proceeding with the operation. A circular incision is made around the cervix as in Figure 1. The point at which this incision is made varies with the length of the cervix. If the cervix is of about the normal length it is made near the level of the external os. If the cervix is very long it had better be made at a higher level or else one will have an excess of mucous membrane for covering the stump. The mucous membrane covering the vaginal portion of the cervix is then dissected back around the entire circumference of the cervix to the point of the reflexion of the vaginal mucous membrane on to the cervix (Fig 1 insert)

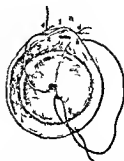


Fig 4 Diagram showing technique of suturing stump

The cervix is then amputated at the desired level in a conical manner. The stump of the cervix at the apex of which there is a conical depression, is then lined by the flap of mucous membrane covering the anterior portion first. This is done by means of a mattress suture of No 3 chromic catgut on a large cervical needle. The method of placing this suture is best demonstrated by observing Figure 4. The suture first pierces the flap of mucous membrane passing from point *a* to *1*. Emerging from behind the flap at point *2*, it is then carried into the shortened cervical canal at point *3* and piercing the shortened cervix anteriorly it emerges into the vagina at the highest possible point *4*. The other end of the suture is then threaded and in an exactly similar manner the needle is carried through points *b*, *c* and *d*. This suture is drawn tight but not tied at this stage of the operation (Fig 2 insert). The posterior flap is sutured in a similar manner. Before tying these sutures any lateral excess of the flap of which there is usually some, is trimmed off so as to have a perfect fitting covering of the stump. The mattress sutures are then tied. Two or three figure of 8 catgut sutures are taken laterally through the mucous membrane flaps, including small bites of the lateral portion of the shortened cervix to approximate the edges of the flap and also for hemostasis. It is seldom necessary to ligate any vessels individually in order to obtain satisfactory hemostasis. We have found it advantageous to place a small one half inch pack in the canal of the stump. The completed operation appears as in Figure 3.

I have performed this operation in 12 cases without postoperative hemorrhage and on examination of the stump on discharging the patient from the hospital it was found to be smoothly covered with mucous membrane. Needless to say the cervical leucorrhoea is cured as the source of it is removed.

MECKEL'S DIVERTICULUM, METHODS OF RESECTION

WITH A REVIEW OF THIRTEEN CASES

BY R. M. HARBIN, M.D., F.A.C.S., ROME, GEORGIA

IN a series of 2,624 abdominal operations in the clinic of Harbin Hospital the incidence of Meckel's diverticulum was noted 13 times, but during the entire series a systematic search had not been made for this condition. However, in 507 consecutive laparotomies in which routine search was practicable, diverticula in the ileum were noted seven times (1.3 per cent). Five of these were noted as causing symptoms among 314 cases with acute abdominal conditions and 2 in 193 elective operations showed no evidence of causing symptoms.

It has been accepted that the incidence of this abnormality in all human beings may be estimated at 2 per cent, and the fact that approximately 1 per cent of routine laparotomies show diverticula which cause symptoms should emphasize the importance of a systematic search. Unless search is contra-indicated our operative records for the last 7 years carry notes of the presence or absence of diverticula in each case. When the ileum is entirely empty a diverticulum may easily escape discovery. This brings up the question as to what we shall do with these apparently symptomless diverticula. An analogous situation exists in our attitude toward the presence of the appendix, and what is true of a so-called fibroid appendix may be true of a diverticulum perhaps undergoing degeneration, as in Case 8. So the question of symptomless appendices and diverticula is still *sub judice* and can not always be settled by operative findings.

Because of its length and laxity of attachments, the ileum is very liable to dysfunction, and when any deformity exists such as is associated with diverticula we can readily perceive how acute and chronic disorders may arise. Primarily a diverticulum may be enormously distended without inflammation (as in Case 9) and before the operation becomes completed it may shrink into an innocent looking appendage. The fact that postoperative difficulties follow certain resections should not deter us from removing these diverticula. Embryonic defects in the small intestine do not furnish a favorable field for plastic surgery because an element of dysfunction may still remain especially in the broad bases of the diverticula. Inasmuch as the deformity has been produced by attenuation of the normal

musculature of the intestine and a more scant vascular and nerve supply, the contiguous walls of the intestine must share some of this lack of vitality. These difficulties would be less in cases in which the diverticula would become merely an offshoot from the peripheral mesial line of arterial anastomosis (Case 1). As a matter of fact the majority of these deformities project more or less laterally from the anterior wall of the ileum. But if this mesial line of arterial anastomosis were uniformly located at *r*, Figure 11, the problem of resection would be simple, but it is probable that this line may vary its location anywhere from *r* to *m*, Figure 11. So we would conclude that the ideal line for resection cannot always be approached, because a high resection at *s* may bring about an avascular area at *a* and one too low at *b* would produce an indented curve or kink in the normal peripheral curve of the ileum.

These are the only theories we have for the necessity of unduly frequent dysfunction, occasionally leading to necessity for secondary operation—the avascular area on the one hand being a site for frequent adhesions and the indented kink on the other hand favorable for the development of mechanical obstruction.

We tested the vascularity of a moderately pedunculated pouch such as occurred in Case 13 by clamping the pouch end at *s*, Figure 11, parallel to the gut well above the line of probable resection, and just below this clamp we made a half way incision down into the muscular coat on both sides. The anterior or upper incision *o*, bled continuously while the posterior one, *i*, bled from veins a few seconds and stopped. This observation seemed to indicate that the mesial line of anastomosis of the blood supply was well below the posterior incision, *i*.

We believe that a more careful consideration of the questions raised by this discussion will help us to a more rational method of resection of these various types of diverticula. For the sake of a standardized technique it is unfortunate that the incidence of this abnormality is so infrequent.

We believe furthermore in view of subsequent complications in certain cases reported that postoperative treatment should be modified to meet the hazard of dysfunction which may lead

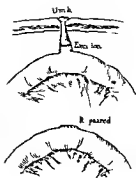


Fig 1 Case 1

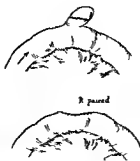


Fig 2 Case 2

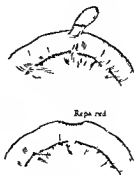


Fig 3 Case 3

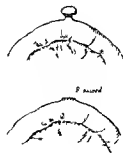


Fig 4 Case 5



Fig 5 Case 8

to obstruction and as a result we have applied the treatment of peritonitis namely very restricted amounts of fluids by mouth with rectal infusions until the bowels shall have been moved on the fourth day

CASE 1 Boy age 1. A diagnosis of acute appendicitis was made. Operation disclosed a negative appendix and an elongated funnel shaped band from the periphery of the gut to the umbilicus. This was resected and patient recovered without complications. I had observed a sinus from the umbilicus of this boy shortly after his birth and a polyp was removed (Fig 1).

CASE 2 Mrs Blank age 31 was operated upon for a pelvic condition. A short pouch with large base was found occupying the periphery causing an angulation of ileum. Resection of the diverticulum left an indentation of the peripheral curve of the intestines. Subsequent symptoms of chronic obstruction required operation 18 months later (Fig 2).

CASE 3 Boy age 20. A diagnosis of acute appendicitis had been made. Operation revealed a negative appendix and inflamed diverticulum somewhat pedunculated attached laterally to the periphery of the gut. Resection left some indentation of the intestinal curve. Acute obstruction on the third day required resection and lateral anastomosis (Fig 3).

CASE 4 Girl age 16. The diagnosis was probably mesenteric thrombosis. Operation disclosed a greatly

distended and gangrenous diverticulum with volvulus. Resection and anastomosis was done but patient died.

CASE 5 Girl age 10. A diagnosis of subacute appendicitis was made. Operation showed a negative appendix and a blunt mushroom shaped diverticulum about periphery of gut. Resection was done and patient recovered with no sequelae (Fig 4).

CASE 6 Boy age 3. Diagnosis of peritonitis was made. At operation we found a gangrenous pear shaped diverticulum which was resected. Patient died.

CASE 7 Miss Blank age 21. Acute appendicitis was diagnosed. At operation we found a perforated appendix which was removed and the incision drained. Fifteen months later she returned for drainage of an abscess about the cecum. Seventeen months later she returned with an acute intestinal obstruction. Operation revealed a pear shaped diverticulum pasted along the side of ileum causing obstruction. One year later she again returned with symptoms of obstruction which responded to palliative treatment.

CASE 8 Miss Blank age 2. A neurotic type complained of persistent left abdominal pain. Diagnosis was undetermined. After 1 year she returned with history of same pain having had a left nephrectomy for tuberculosis (?) in another clinic. Exploratory operation revealed entirely negative findings except for a degenerative fibroid thickening of the walls of a diverticulum. The appendix was apparently normal (Fig 5). Pain was relieved but the neurosis persisted.

CASE 9 A man age 34. A diagnosis of acute appendicitis was made. Operation revealed a congested diverticulum greatly distended to the size of a small pear having a somewhat lateral attachment. This was replaced and with gauze pack in the abdomen the appendix was found to be acutely inflamed and after its removal the diverticulum was again inspected. The diverticulum now had shrunk to about a fifth of the original size and was infolded without resection with several deep layers of sutures (Fig 6). No sequelae have been reported. This case shows the degree of dysfunction possible by the extreme dilatation.

CASE 10 Miss Blank age 20. A diagnosis was made of subacute appendicitis. The operative findings were a negative appendix and a stubby diverticulum with a broad base located somewhat anterolaterally to the periphery of the gut. Without resection the diverticulum was infolded with deep sutures (Fig 7). No sequelae have been reported.

CASE 11 Mrs Blank a widow age 36. A diagnosis was made of probable diverticulitis. The operative findings were a negative appendix and a large broad based diverticulum (Fig 8) attached somewhat laterally resembling an



Fig 6 Case 9



FIG 7 Case 10



Fig 8 Case 11



Fig 9 Case 13 Reduced one fourth

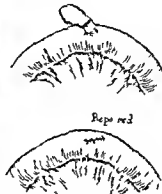


Fig 10 Case 13

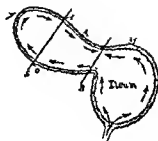


Fig 11

oblong irregular potato. This was resected and infolded with sutures. Notwithstanding the application of post-operative treatment for peritonitis she had symptoms of partial obstruction which subsided in due time.

CASE 12 Girl age 16 was operated upon for acute appendicitis and the findings were a greatly distended and elongated diverticulum with a broad base (Fig. 9) the tip being attached to the ileocaecal valve and collateral adhesions to the right tube and ovary. The appendix was mildly diseased. The diverticulum was resected. Seven months later she returned with an acute obstruction. The site of resection was identified and this portion of the ileum was rotated up 90 degrees being held by an adhesion. No sequelae have been reported.

CASE 13 Mrs. Blank, age 36 before marriage had had salpingectomy and appendectomy 10 years ago, at which time no search was made for diverticula. Her chief complaint was dysmenorrhea associated with abdominal pains. Adhesions were numerous in the pelvis and the right ovary was removed. The diverticulum was apparently symptomless and laterally attached extending to the mesenteric border of the ileum (Fig. 10). The vascularity of the diverticulum was tested as per diagram Figure 11. Postoperative treatment was that of peritonitis and was attended with a moderate degree of gas pains. No sequelae were reported at end of 1 month.

SUMMARY

These case records may be summarized as follows:

- 1 The youngest patient was 3, the oldest 36, and average age was 22 years.
- 2 In 10, 70 per cent, Meckel's diverticulum seemed to be causing symptoms.

3 The pre-operative diagnosis of diverticulitis was recorded only once in this series, and this was subacute in type.

4 While the distance from the ileocaecal valve cannot always be accurately estimated these diverticula seemed to be uniformly about 14 to 16 inches from the caecum.

5 As to site, 4 were peripheral, 9 more or less lateral, and as to shape 2 were tubular, 3 blunt, 5 pedunculated, and 3 undetermined.

6 Eleven were resected and two infolded. Two of the acute type required subsequent operation for acute obstruction and one symptomless diverticulum was resected and required subsequent operation for chronic obstruction.

7 One so-called symptomless diverticulum was finally the cause of acute obstruction in a patient who had had operations for perforated appendix and later had an abscess behind the caecum.

8 There were two deaths, 15 per cent.

CONCLUSIONS

- 1 When not contra-indicated in abdominal operations a routine search should be made for Meckel's diverticulum.

2 In determining the level for resection, the line of mesial anastomosis of arterial supply as far as possible should be estimated

3 We should avoid low resections (the common error) that lessen the lumen of the gut and

high amputations with a redundant stump which may lead to consequent adhesions

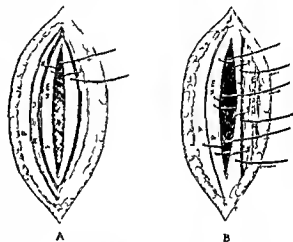
4 Because of a probability of dysfunction the postoperative treatment of resection should be that of peritonitis

A SATISFACTORY METHOD OF CLOSING THE "DIFFICULT" PERITONEUM

BY A J WARD M D MORRISTOWN NEW JERSEY

ALL surgeons have at times encountered difficulty in closing the peritoneum. I refer to the so called tissue paper peritoneum which offers little anchorage especially when the tension is great. The following is the method used at the Morristown Memorial Hospital and called 'the Glazebrook stitch' as it was first practiced by Dr Francis H Glazebrook senior member of the surgical staff at this hospital.

The peritoneal suture line is started in the usual manner. The stitch is carried through the peritoneum from above downward, or from outside in, and is then looped over the edge of the peritoneum again in the same manner rolling the edge. This second stitch may be carried through the under surface of the rectus muscle. The needle is then brought to the opposite side reversed and the same procedure executed provided the rectus muscle has been split otherwise with medial or lateral retraction of the rectus muscle it requires a double whip over stitch through peritoneum on one side with the peritoneal muscle stitch as described above on the other. The suture is drawn up tightly and the rolled peritoneum is approximated to peritoneum. The virtue in the double stitch is that the peritoneum is rolled on



1 Split rectus incision and 2 medial or lateral retraction of rectus muscle

itself several times thereby giving a reinforced edge through which sutures will not tear so readily as they will when a single stitch is used. When the rectus muscle is included in the second loop a stronger anchorage is given to the peritoneal suture line.

A CRITICAL REVIEW OF FIVE HUNDRED CONSECUTIVE DELIVERIES¹

By CARL HENRY DAVIS, M.D. F.A.C.S., MILWAUKEE, WISCONSIN

It is only through the critical examination of results that one may correct impressions and prepare to do better work. The present study has been made from the office and hospital records of my first 500 deliveries in Milwaukee. For the sake of brevity, as many of the data as possible have been grouped in a series of tables.

TABLE I—PRESENTATION AND POSITION IN EARLY LABOR—478 CASES

	Spontaneous delivery	Operative delivery	Total
Occiput left anterior	123	81	204
Occiput right anterior	45	37	82
Occiput right posterior	20	37	57
Occiput left posterior	5	25	30
Occiput right transverse	0	28	28
Occiput left transverse	5	47	52
Breech	16	7	23
Transverse	1	1	2
Face mento posterior position	1	1	2
Total			478

Table I shows that while the distribution between left and right positions is approximately in keeping with the usual teaching there are a relatively large number of cases in which the fetal head entered the pelvis in the transverse position. A long first stage of labor was the rule when the head entered in the transverse and, as shown in the table, most of the cases required some type of interference.

TABLE II—TYPE OF DELIVERY IN 500 CONSECUTIVE LABORS

210 Spontaneous—no vaginal manipulations	
Vertex	194
Breech	16
290 Operative—one or more types of interference	
Voorhees bag	29
Bougie	4
Version and extraction	10
Vaginal hysterotomy	1
Blunt hook in breech	1
Cesarean section	16
Forceps after coming head	5
Forceps	243

TABLE III—MORTALITY IN 500 LABORS—508 BABIES

Maternal death, eclampsia	1 or 0.2 per cent
Fetal deaths all causes (first month 6)	18 or 3.5 per cent

¹Read before the Chicago Gynecological Society February 19, 1926 (For discussion see p. 544)

TABLE IV—FETAL DEATHS, UNAVOIDABLE CAUSES IN 508 BABIES

Prematurity 7 months after partial separation placenta	1
Congenital heart disease	3
Premature separation placenta before admission	2
Hemorrhagic disease of newborn	1
Anencephalus	2
Dead in utero before labor	4
Total	13
One mother had a 4 plus Wassermann, others negative	

TABLE V—FETAL DEATHS DUE TO OBSTETRICAL CAUSES IN 500 CASES

Easy normal labor with concealed prolapse of cord	1
Long first stage, fetal asphyxia, version and extraction	3
Erysipelas after circumcision	1
Total	5

TABLE VI—FORCEPS DELIVERIES IN VERTEX PRESENTATIONS

High application	1
Mid application	114
Low application	117
Total	243
Stillbirths	0
Fetal deaths first month	2
Prematurity 1, hemorrhagic disease, 1, total, 2	

TABLE VII—EPISIOTOMIES IN 484 VAGINAL DELIVERIES

	Number	Per cent
210 Spontaneous deliveries	123	58.5
274 Operative deliveries	179	65.0
Total	302	62.0

TABLE VIII—MORBIDITY IN 477 DELIVERIES AT COLUMBIA HOSPITAL

	Temp. 100.4 on 1 day	Temp. 100.4 2 or more days on admission	Respiratory infection
180 Spontaneous labors	10	8	3
231 Operative per vaginam	25	14	7
16 Cesarean sections	2	11	0
Severe puerperal sepsis after 1 Cesarean section			No
other case with clinical evidence of seps 15			

DISCUSSION

Medical men in taking over the century old duties of the midwife assumed a definite responsibility. The obstetrician must be more than a man midwife. Obstetrical care, as Williams has

said calls for "Such supervision of the pregnant woman as will enable her to go through pregnancy safely to bring forth a normal living child with a minimum of danger, and to be discharged in such good physical condition as to be able to care for her child efficiently and to suckle it for at least the first months of its life." In view of present knowledge it should be our aim to discharge the average woman in a better physical condition than she was in before her pregnancy.

Most of the patients in this series were examined during the first trimester. So far as possible abnormalities which might complicate pregnancy or labor were noted and if possible corrected. Infected teeth, tonsils and chronic endocervicitis were the most common conditions found. Formerly the care of the teeth was left to the judgment of the dentist. But after one disaster and several severe complications in which focal infection played an important part, an array of all dead teeth has been requested and removal of definitely infected ones has been urged. The fact that many women with infected teeth and tonsils pass through one or more pregnancies without serious complications is a poor excuse for permitting them to remain. Talbot is undoubtedly correct in asserting that every woman who develops a toxæmia of pregnancy has one or more foci of chronic infection. It is my belief that the clearing up of chronic infection is the most important part of prenatal care. With the patient in a healthy condition our duty is to maintain that condition.

This requires periodic examination of the urine and a record of the blood pressure and weight. A rapid increase in weight should be regarded with suspicion especially in the latter weeks of pregnancy as it frequently means an impending toxæmia. Tissue oedema frequently occurs before there is an increase in blood pressure or albumin in the urine. Prompt eliminative measures such as castor oil or magnesium sulphate and rest in bed on a limited diet may prevent more serious complications. In obstetrics as in many other departments of medicine prevention is more satisfactory than attempts to cure.

Early in this series 2 patients developed convulsions and 1 died. Both had been under prenatal care since the early months of pregnancy. Both had dead teeth which their dentists were not willing to remove. The one who died developed albumin and casts when 7½ months pregnant. When the amount showed an increase in spite of eliminative and dietary treatment a badly abscessed tooth was extracted. Labor was induced at the middle of the ninth month with

castor oil and quinine. The first convulsion occurred when dilatation was nearly complete therefore the labor was terminated with forceps. After one more convulsion she recovered consciousness but 12 hours later she had 3 convulsions within 15 minutes and the heart stopped with the third. Sections of the kidneys showed acute congestion and small hæmorrhages. Sections of the liver showed the typical appearance of eclampsia.

The second patient developed a slight toxæmia a few days before term. There was a heavy trace of albumin and the blood pressure increased from 130 to 140 millimeters without increase in weight. With castor oil and quinine she went into labor. A low forceps delivery eliminated the expulsive efforts of the second stage. Six hours after her return to bed she had the first convulsion. The treatment included morphine, gastro-intestinal flushing and finally bleeding. Fortunately she recovered. Subsequently her dentist removed 11 infected teeth.

Comparatively little can be done to cure endocervicitis during pregnancy. Frequent treatment by drying the cervix and vaginal mucosa with cotton and then painting it with 5 per cent mercurochrome or compound tincture benzoin has lessened the discomfort from the irritating discharge and may possibly reduce the risk from infection at the time of delivery. The cautery has been used cautiously in a few selected cases but is only advised for bleeding polypoid areas.

LABOR

Labor at best is an unpleasant ordeal. Thoughtful consideration of the mental and physical suffering of the patient by nurses, internes and the obstetrician makes for a minimum of discomfort. The patient must be individualized and labor conducted according to her particular needs. No longer do medical men try to conduct labor under a sheet but undue exposure of the patient should be avoided. Even rectal examinations are unpleasant and not entirely safe so they should be restricted to as few as possible. Vaginal examinations should be limited to definite indications and made only after careful surgical preparation. Delayed labor with a head in the pelvis usually warrants a vaginal examination. It should not be made as a rule before engagement.

The pain of the first stage may be minimized through hypodermic medication. Small doses of hyoscine (grains 1/200) with heroine (grains 1/24) or morphine (grains 1/12) have been administered as needed in this series with much benefit to the patient and no serious effects to the baby.

other than a possible delay in respiratory efforts. Heroin is superior to morphine. Pantopon will be used when our limited supply of heroin is exhausted. Intermittent gas analgesia with nitrous oxide-oxygen or ethylene oxygen is started late in the first stage and continued until the labor is complete. Ethylene is the more powerful anesthetic and probably gives more satisfactory results. Most anesthetists fail to give the maximum relief through too much delay in administering the gas at the beginning of the contraction. Once pain is established the memory of it will be carried even though the gas is administered to complete anesthesia.

The fetal heart beats should be counted at frequent intervals during the second stage of labor, and every few minutes during the perineal stage. Early in this series a baby was lost from concealed prolapse of the cord just because the fetal heart beats were not counted during the 15 minutes between the appearance of the caput and the delivery. Changes in the fetal heart rate are the only signs of impending asphyxia and they must not be ignored. There were 6 true knots of the cord in this series of 508 babies and in 5 of these the knot pulled tight causing asphyxia during the perineal stage. Prompt delivery enabled us to save these 5 babies. In the sixth case the knot was pulled tight and the placenta separated before the patient entered the hospital. Concealed prolapse of the cord is a treacherous complication and probably a fairly common cause of fetal asphyxia. Loops of cord around the neck may be drawn tight or compressed during the perineal stage.

The use of a posterolateral episiotomy and Kristeller pressure shortens the perineal stage and reduces the period of pressure on the fetal head. The edema which occurs in a long perineal stage certainly does the baby more harm than the careful use of forceps. Pituitrin is contra-indicated when there is any evidence of fetal asphyxia. In hospital practice a low forceps delivery in case of ineffective contractions seems more conservative than the use of pituitary extract.

THE DELIVERY

In the delivery of the 500 patients in this series we have kept in mind the obstetrical ideal as stated by Williams and have used the method which in the individual case seemed to promise the greatest safety for both mother and child. A series of private patients cannot be compared with a clinic series or a mixed series. Over 300 of these were primiparae. Many of the multiparae had histories of difficulties in one or more previ-

ous pregnancies. Several had lost more than one baby at birth or soon after. Eleven of the 16 cesarean sections were performed after a long test of labor. One of these expelled a No. 5 Voorhees bag 4 hours before the section. She was two weeks overdue and the first labor had been terminated with a difficult forceps.

Forceps were employed 243 times in vertex presentations and 5 times to the after-coming head. The 243 babies were all delivered alive. In a number of the mid-forceps deliveries an oblique application resulted in a temporary facial paralysis. One premature baby died on the seventh day and a second died from hemorrhagic disease on the fourth day. The other 241 were discharged from the hospital in good condition and so far as can be determined have developed normally. In one case when forceps were applied to the after-coming head the baby was stillborn but pulsation of the cord had practically ceased when the version was performed. In the other 4 cases there was difficulty in delivering large heads and it is believed that the use of forceps materially lessened the risk of injury to the nervous system.

Various types of instruments were used. The Webster modification of the Milne Murray axis-traction forceps was used for most of the mid-positions. A short Elliott was the instrument of choice for many of the low applications and for the after-coming head. The Kielland forceps has been used with fairly satisfactory results in a few cases.

Contamination from the anus may occur during the application of forceps unless the operator is very careful. The chances may be reduced to the minimum by introducing all four fingers of the right hand and, after applying the first blade by rotating the hand to the other side instead of employing the usual method of withdrawal and introduction of the other hand. This is only possible in low or mid applications. An assistant should keep pressure on the fundus during the introduction of the blades to lessen the pushing up of the head and reduce the risk of a prolapsed cord.

Forceps in this series have been used to aid the head through the pelvis rather than to pull it through. So far as possible the force required has been exerted from above through Kristeller pressure and the expulsive efforts of the patient, and the pull from below has been limited to a few pounds. Used in this manner a good axis-traction instrument has definite advantages over the other types in that it gives the head a better chance to follow the pelvic curves. Tarnier devised his

instrument for compression of the head in pulling it through the pelvis of women who would be delivered by cesarean section today. The construction of the blades tends to place all the pressure on the tips; the handles of the blades are too heavy and the traction handle tempts the tyro to brace his feet against the table and pull with both hands.

No effort has been made to change a breech into a vertex presentation. In this series 22 normal babies presented by the breech and they were delivered without serious difficulty and without mortality or evidence of injury. The only still birth in this group was an anencephalic monster which went 2 months past term and was delivered by a blunt hook after a bag induction.

Version was limited to definite indications and was not considered as a method of delivery in cases which could be delivered *per vaginam* easily by other methods. There were 4 stillbirths in 10 deliveries by version and extraction, but 1 fetus was dead from premature separation of the placenta and the other 3 had a fetal heart rate under 100 before the version was attempted. In the 6 cases in which the baby was in good condition there was no mortality. An arm was broken in turning the baby with a transverse presentation. Just how this happened is not known as the arms were delivered without difficulty. It is probable that version should have been used instead of forceps in some of the occipitoposterior positions.

Voorhees bags were used 29 times in 500 labors, approximately 6 per cent. The main indications were for induction when castor oil and quinine failed and in cases with premature rupture of the membranes. There were no complications which could be charged to the use of the bag. The bougie for induction has been limited to 5 cases in which the head was deep in the pelvis. In one of these the placenta showed that the heavy rubber tube had been passed across the center of the placental area. Fortunately it did not lead to a premature separation.

Sixteen cesarean sections of the classical type were performed on 13 patients. Eleven were after rather long tests of labor. Two patients had the tubes resected by request. Two had a diseased appendix and one a diseased right tube removed. This last patient promptly developed peritonitis but eventually recovered. The charts of these 5 patients indicate that the addition of other operative work definitely increases the morbidity and therefore adds to the risk. Two of the patients in the cesarean section group developed phlebitis and one had a small pulmonary embolus. These

were the only cases of phlebitis in the entire series. One other patient had symptoms a few hours after delivery which suggested a small embolus, but she developed none of the later signs.

SURGICAL TECHNIQUE

The continued frequency of puerperal sepsis is a sad commentary on delivery room technique. The puerperal woman is very susceptible to infection, and it is believed that she is entitled to the same careful aseptic technique she would receive for an abdominal operation. So far as possible that has been attempted in this series. The results in the morbidity table indicate that this effort was worth while. Cultures made from the labia after the usual methods of cleansing with soap and lysol solution showed so many colonies of gram positive cocci that additional preparation has been thought advisable. For a time half strength tincture of iodine was tried but it frequently caused considerable irritation. For over 7 years a 5 per cent solution of mercurochrome has been painted over the field after the usual type of cleansing. The labia and vaginal orifice are given several coats and in operative cases the vaginal mucosa is painted as a part of the preparation. If possible this should be done 5 minutes before the delivery. The value of this has been demonstrated in cultural studies and is also seen in the practical absence of morbidity during the puerperium. Early in this series a gauze pack was usually placed in the vagina during the repair of the episiotomy or the lacerations. It was recognized that bacteria might be carried to the cervix so for over 2 years no gauze has been used in the vagina during a repair. Since these two changes in technique have been made, in 100 spontaneous labors there have been only 5 patients in whom the temperature has at any time reached 100.4 degrees F and the only patient with a fever on more than 1 day had a septic sore throat and fever at the time of delivery. The morbidity as shown by temperature is also reduced in the operative cases.

Bleeding during the third stage of labor has been materially lessened by the administration of 1 cubic centimeter of pituitary extract just as the cord is tied. Since there were only 3 manual removals of the placenta in the entire series it is evident that the use of this measure has not been responsible for retained placentas. The third stage is treated by the hands off method until the placenta has separated and been expressed into the lower uterine segment or the vagina. It is then expressed by supporting the fundus and having the patient bear down if she is conscious.

or by gentle pressure if she is under an anæsthetic. As soon as the major portion of the placenta has passed through the introitus, the uterus is lifted by pressing the fingers in deeply just above the symphysis, and the membranes usually come away without any twisting.

The episiotomy or the lacerations, if present, are usually repaired while we wait for the placenta to separate. No one plan has been followed in the repair of lacerations. For the most part 40 day chromic catgut has been used. A deep buttonhole stitch has been used for the vaginal mucosa and interrupted stitches for the skin. In only a few cases have the knots been buried. Slight infection or sloughing due to strangulation of tissue has occurred in a few instances but in only one was secondary suture required. Three complete tears healed by primary union. Hot glycerine pads help relieve the œdema which is a frequent cause of discomfort during the first few days. Painting with mercurochrome and exposing the perineum to the air part of each day also adds to the comfort.

When the patient is returned to bed the head of the bed is elevated about 7 inches with blocks so as to favor drainage from the vagina. It is believed that the bacteria laden pool of bloody discharge which collects about the cervix when the patient lies on her back may play an important part in some cases of sepsis. The blocks are usually removed on the evening of the fourth day.

POSTPARTUM CARE

A hypodermic of codein is given as needed during the first few days. Hyoscine is frequently added the first night so as to insure sleep. Bromides are used freely to lessen the nervous tension which is so commonly present. Visitors are limited to the family during the first week.

The baby is put to breast for a few minutes every 6 hours until the milk comes in and then every 4 hours except for the 2 a m nursing which is omitted from the first. The babies are given a weak formula or mothers milk which has been pumped during the day for this feeding. Elevation of the breasts, ice caps, and pumping with Abt's electric breast pump do much to relieve the period of engorgement. A number of the patients developed non suppurative inflammation of the breast and 10 patients, or 2 per cent, developed a suppurative mastitis at some time during the puerperium but in no case did this occur during the first 2 weeks. Four of these had to have hospital treatment. The other 6 were cared for at home as the infection was superficial. A few patients in this series had rather severe foreign pro-

tein reactions from pressure on the breasts. With one exception this occurred after the patient left the hospital. The breasts should be supported rather than pressed down according to the prevailing American styles. Too much pressure may cause milk absorption with a resulting chill and high temperature. With elevation of the breasts and the use of ice or heat the symptoms subside.

Most of the patients in this series have been up in a chair by the evening of the sixth day. However, no patient is urged to get out of bed until such time as she may feel like it. Patients are permitted to have the back rest up a little and are encouraged to move about in bed after the first few hours. It is believed that the early movement and early getting up lessens the danger of thrombosis. It should be noted that the only two patients in the series who developed phlebitis had been delivered by cesarean section. One of these had a small pulmonary embolus on the eleventh day and the phlebitis in the left leg appeared after she had been kept quiet on her back for a week. She subsequently had a similar involvement in the other leg. She has been carried through another cesarean section since then without trouble. Elevation of the legs for this condition is best accomplished by elevating the foot of the bed and raising the backrest. This posture has been used for about 10 years in treating these cases and has been found more comfortable than the methods usually employed.

Very few patients in this series have remained in the hospital longer than 2 weeks. The longest was 78 days for a patient who had broncho pneumonia on admission. While they are usually up in a chair on the sixth day their activity is much limited during the first 3 weeks. Patients are warned that it takes at least 6 weeks for the organs to return to normal. They are asked to return to the office for examination during the sixth week. At the time of this examination retro displacements are corrected if possible and a suitable pessary inserted. When endocervicitis is found the patient is asked to return for another examination and cautery treatment in about two weeks. Cautery treatment at this time is practically painless and the healing is usually complete within 4 weeks. Following this treatment the cervical canal is cleaned out each week or 10 days and painted with mercurochrome or compound tincture of benzoin until healing is complete.

In each case an effort is made to restore the patient to a normal condition of health before she is discharged. If she has a pathological condition other than pelvic, she is returned to her family physician and urged to stay under medical care.

AMPUTATION STUMPS OF LOWER EXTREMITIES THE CAUSES AND TREATMENT OF PROLONGED DISABILITY

By H R CONN M D AKRON OHIO

THE mental reaction of the patient recently the victim of a major amputation is not frequently one of abounding contentment. Mental depression however cannot explain the existence of the numberless dissatisfied amputees who weary the makers of the prosthesis the state industrial compensation boards, and the law courts. The maimed wage earner is justly sensitive to his permanent handicap, and only the speedy possession of a painless stump, capable of tolerating an artificial appliance restoring a fair portion of the former function, serves to dull his sensibility to misfortune. On the contrary the stump which does not quickly tolerate suitable prosthesis and which lacks something of a surgical triumph cannot fail to deepen the feeling of permanent loss and make doubly hard the labor of rehabilitation. Such was particularly true among the victims of the late war, several hundred of whom the writer came in close contact with as one time chief of the amputation service at the Walter Reed General Hospital.

Wilson first directed attention to the advantages of early weight bearing and the beneficial results which accrue both physiologically and psychologically from a shortened period of inactivity. An overwhelming majority of the stumps incapable of early functional use present definite remediable lesions inviting prompt surgical intervention. Unfortunately a considerable number of patients defer necessary reamputations and vainly seek comfort in innumerable and expensive changes of appliance. Early weight bearing is a purely arbitrary term and it is difficult or impossible to fix a period at which normal convalescence should end and at which needless inactivity begins. The stump functionally inert unhealed or excessively painful 6 months after operation is however most certainly unsatisfactory.

In considering reoperation upon the unsatisfactory stump a comprehensive knowledge of modern prostheses their mechanisms limitations and the functional demands upon the stump is imperative. Certain general principles may be mentioned in regard to the usual amputations but in special cases a preoperative consultation with the brace maker may prove invaluable. The common artificial appliances for the lower extremity demand a stump possessed with func-

tional activity, conical in shape tapering smoothly to the distal end and capable of enduring lateral pressure. The larger portion of the body weight is supported by the first bony protuberance above the site of amputation, i.e. the head of the tibia or the tuberosity of the ischium. The successful management of the appliance is dependent upon the motile power of the stump and the perfect fit of the fleshy cone into the mechanical socket. Few modern types of leg appliance call for even partial end bearing stumps, the exceptions being the very short below knee stump and some of the special amputations at or below the ankle. Unfortunately the end bearing idea has so affected surgical technique as to lead even yet to the deliberate fashioning of huge flaps of muscle yielding bulbous stumps, which are impossible of adaptation to any modern cone bearing appliance.

MECHANICAL DEFECTS

Many stumps while thoroughly sound, present purely mechanical obstacles to successful fitting, and as a rule constitute a class in which immediate operation is indicated. The familiar equinovarus deformity following a Chopart amputation being a common example. Tenotomy of the heel cord and forcible correction, combined with transplantation of the tibialis anticus outward and fixation of the long flexors and the peronei, offers hope of relief, but the usual Chopart amputation presents such poor distal covering as to render inadvisable attempts to rectify an existing deformity. Reamputation after the method of Syme yields the best functional result.

Particularly unsatisfactory are the stumps of too great length, often complicated by circulatory disturbances and a predisposition to terminal ulceration. The unnecessary length may leave insufficient room in the bucket to insert the mechanism of the artificial ankle or knee, a surgical mistake is tragically apparent as its only solution.

The fibula of equal or greater length than the tibia is practically certain to render the leg stump unfit for prosthesis. Complete excision of the fibula, while popular, is unnecessary in stumps of 8 inches or more but highly advisable in those of 5 inches or less. The operation presents cer-

tain difficulties as a rule not anticipated, the fibular head does not dislocate readily, the capsule of the knee joint is in close relation to the upper tip of the bone, and hemorrhage from the posterior tibial artery, if inadvertently induced, is deep seated and inaccessible. The excision of the fibula is much simplified by a subperiosteal extirpation, following which the periosteum should be fully excised. Injury to the posterior tibial nerve is thus easily avoided and any bleeding controlled with ease. The danger of opening the knee joint is very real and greatly increased unless the excision is done subperiosteally. Particular caution is imperative if the stump is in completely healed and infection has existed or does exist.

Stumps which fail to shrink and remain broad on their distal ends often reveal radiographically a bony bridge between the tibia and the fibula. Etiologically this complication is comparable to bony spurs, fraying of the terminal periosteum at the primary operation being chiefly responsible for their development. Excision is indicated, unfortunately, however, recurrences are frequent after a simple excision of a bony bridge, and complete extirpation of the fibula is recommended.

The mere existence of a sharp and painful bone end does not demand operation, as frequently, the artificial bucket may be sculptured out to relieve pressure and afford relief. This also applies to bony spurs. Not infrequently spurs of considerable length fail to give symptoms and, inasmuch as their excision is often followed by a flare up of the infection which played a part in their development, operative removal should be considered with restraint. When excision must be done, it is advisable, after the insertion of adequate dependent drainage, to suture into the lateral margins of the wound two or more Dakin tubes, taking care to see that they reach the site of the excision.

Above the knee the commonest mechanical fault is a stump which interferes with the mechanism or knee block of the prosthesis. This fault is inherent in certain primary amputations such as the Gritti Stokes and the osteoplastic methods of Chutro. The knee block may be set lower to accommodate these amputations but patients as a rule are not pleased with knees which bend at different levels. Reamputation is advisable.

Contractures of the knee and the hip renders many stumps unfit for prosthesis. At the knee flexion contractures usually yield to corrective plasters with successive wedging. The final

five degrees of extension are difficult or impossible to attain but may be disregarded, as correction is commonly spontaneous after the beginning of weight bearing. Bennett has offered a valuable method of tendon lengthening at the knee which may be applied in selected cases in which there is limitation of flexion. Complete bony ankylosis in any position offers so serious an obstacle to satisfactory prosthesis that reamputation above the knee is quite justifiable. Flexion deformity at the hip yields as a rule to massage and stretching. A Soutter fasciotomy is warranted in the extreme cases.

Following mid thigh amputations the femur will not infrequently be found to have assumed a flexed and abducted position with relation to the soft parts, the terminal and external bone edge lying just below the skin (Fig. 1). A painful bursa may be present at the site of pressure. On palpation the impression is gained that the adductor muscles have fallen away from the femoral shaft where they hang in a flabby dependent sac. Such a stump is not only painful but functionally inert and is not improved by a simple resection of the bone end. The true condition is hernia in type. Guillotine amputation, particularly when the muscle planes have been separated for drainage, is a predisposing factor. Other causes are loose postoperative bandages, prolonged recumbency, and an imperfect closure of the fascia lata and deep structures at the primary operation. All of these factors permit the gradual separation of the external musculature, the adductors sag away and the shortened femur assumes a flexed and abducted position in relation to the soft parts.

The writer corrected this condition by an external longitudinal excision exposing the femoral shaft, the bursa and scar tissue were freely excised and by blunt dissection a bed for the femur was formed in the center of the muscle mass (Fig. 2). The rectus femoris in front and the vastus lateralis behind were freed and sutured over the bone so as to assure retention (Fig. 3). As further security the freed and identified margins of the fascia lata were imbricated with chromic gut (Fig. 4). The skin wound was closed in the usual manner. The parts thus restored to their normal relations, these stumps promptly assume a firmer and more conical aspect with a re-establishment of functional activity.

The occurrence of mushroom or bulbous stumps overshadows numerically all the other mechanical obstacles to successful prosthesis. A limited number are attributable to circulatory derangements and bony defects. The majority exist to discredit the fallacious practice of suturing thick

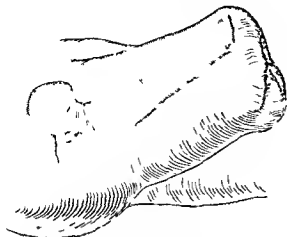


Fig. 1 Schematic view of a right thigh stump showing the flexion and abduction of the femur in relation to the soft parts

flaps of muscle and fat over the bone end. The anticipated shrinkage often fails to materialize and the stump after a lapse of several months retains its mushroom-like contour. Bandaging and prolonged operative delay are of trifling benefit, the better procedure being a reasonably prompt and bold resection of the redundant muscle and fibrous tissue.

PATHOLOGICAL DEFECTS

Septic infection, existent or pre-existent, serves to delay the surgical correction of many purely mechanical faults. The most treacherous is the quiescent type which blocks the lymph channels and exists dormant, prepared in the advent of operative release to flare forth with all its primary virulence. No single symptom of quiescent infection compares in importance with the presence of a mild, scarcely discernible oedema in the distal tissues. Its existence is revealed more often by palpation than by sight and its presence more often suspected than proved. Any operative or manipulative procedure in the presence of even a suspicion of this terminal oedema is unconditionally contraindicated. Bandaging and hot compresses of a saturated solution of Epsom salts act to hasten the subsidence of terminal oedema, but time alone serves to render any operative procedure safe. The period of delay must vary, but, as a rule, 3 months at least should elapse after the final disappearance of any trace of infection stasis, before reoperation.

Coexistent with terminal sinuses or ulceration, an infectious marginal eczema of a most persistent type is frequently encountered. Undoubtedly

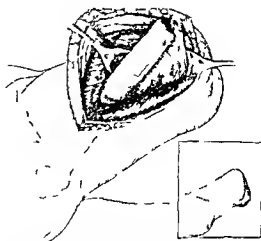


Fig. 2 The femur freed by extensive dissection. The quadratus femoris in front and the vastus lateralis behind retracted to permit the fashioning of a new bed and a deep reburial of the femoral shaft. Insert indicates the line of the skin incision.

ly it is a secondary skin infection engendered by the continuous bathing of the marginal skin in a purulent discharge. Such an eczema is likely to be quite intractable and unfortunately the infectious nature prohibits the intervention necessary to eliminate the cause. Plastic operations are almost certain to fail when attempted in the presence of these skin infections. Antiseptic ointments have given disappointing results as have all wet dressings. Both seem to macerate the tissue and at times aggravate the lesion. The selective dyes such as mercurochrome and gentian violet have given better results. The skin should be deeply stained by a daily application and protected as much as possible by frequent changes of dressings. Attention is called to the fact that these two drugs are incompatible and should not be used together or on successive days. The chronic cases with thickening and brawniness are best treated with X-ray.

Since end bearing has become at least partially unessential to the function of modern appliances, a suture line directly over the bone end is not a disadvantage and even may be of benefit as anterior and posterior scars have the disadvantage of being subjected to friction against the prosthetic cone. Terminal, adherent scars, however, cause a skin pull as the upward thrust of weight bearing is applied to the lateral surfaces. The adherent scars may frequently be massaged loose or occasionally the fibrous adherent bands divided by a tenotome with the same technique as for a subcutaneous tenotomy; those more deeply adherent

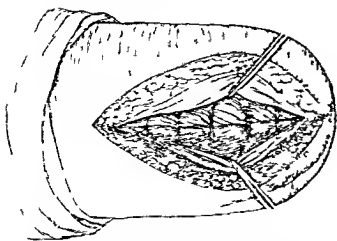


Fig 3 The skin and fascia lata retracted to reveal the deep muscular sutures in the quadratus femoris and vastus lateralis the femur thus being secured in its new position

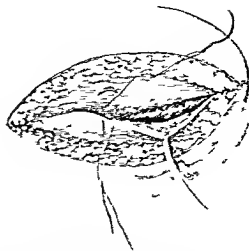


Fig 4 The method of closing the skin and fascia lata illustrating the imbrication accomplished by the use of mattress stitches and a continuous suture

require plastic resection. The chronic, indolent, infected, terminal ulcer which heals spontaneously is almost certain to produce an adherent scar. Those, however, which fail to heal constitute a large group and are prohibitory to early weight-bearing. Excision is indicated and should not be delayed unless there are signs of an infectious oedema.

The technique is important especially so when smears from the ulcer base disclose micro-organisms. The ulcer and underlying fibrous tissue require excision en masse, free dependent drainage is of prime importance, for which purpose the Chutro drain is ideal. Closure of the skin flaps should be snug and smooth with the suture line free from loose folds and dog ears.

The treatment of terminal osteomyelitis and sequestration is similar to that approvable for these lesions elsewhere. Sequestration does not entirely prohibit early weight bearing; in fact the separation of sequestra seems to be often hastened by the functional activity.

Allied to these frankly septic bone complications is the mushroom bone end. Fraying of the periosteum at the primary operation followed by sepsis engenders the proliferation of irregular and untoward bony growths which are as a rule hypersensitive to an extent which prohibits the pressure of an appliance. Reamputation is generally imperative, if the new bone masses are rough and large. At operation the terminal one-fourth inch of periosteum should be denuded after the method of Bunge. Removal of the terminal endosteum, while advocated, seriously endangers the terminal blood supply and has twice been observed to have caused a sequestration. It seems doubtful if removal of the endosteum is

necessary or wise as very satisfactory stumps have resulted from removal of the periosteum only.

NERVE LESIONS

A large percentage of all the unsatisfactory stumps comprise the group in which there are no apparent mechanical or pathological lesions and in which pain is the single prohibitory factor to successful prosthesis. Pain immediately following a primary operation and persisting for several weeks thereafter in an otherwise normal stump is generally attributable to a peripheral neuritis, the result of misguided traction upon the nerve trunks at operation. Intraperineural injection of absolute alcohol while extremely valuable in allaying post-operative pain, will not affect the neuritis resulting from traction to the nerve trunk. More persistent and less acute is the pain which results from the contraction of fibrous tissue about a nerve stump. The pain, dull and constant in type, is aggravated by pressure to an extent which renders a snug bandage intolerable. Recovery from these somewhat similar lesions is as a rule spontaneous. Operative resection of the nerve trunk is mentioned only to be condemned until after a lapse of 6 months. Paraffine baths and diathermy during the convalescent period may afford marked relief.

Quite different is the treatment indicated for true neuromata where nothing avails short of surgical excision followed by an intraperineural injection of absolute alcohol. Fixation of the nerve end combined with careful suturing of the nerve sheath has many advocates but the writer prefers division with the actual cautery.

Symptomatically these nerve lesions by their similarity render difficult the differentiation which

their treatment requires. The mistake of surgically traumatizing an existing neuritis is quite comparable to the error of treating a painful neuroma expectantly. The character of the pain is the most valuable single point in the differentiation—that of the neuritis is sharp and lancinating in character and referred upward along the nerve trunk, the pain from fibrous constriction is dull and more constant and almost never referred upward, nor is it projected downward unless pressure is made directly over the nerve stump. In distinction the pain resulting from a neuroma is particularly projectile following exactly the course and distribution of the involved trunk to an extent which induces the patient to complain bitterly of pain in the distal and severed member.

SUMMARY

The measure of successful amputation is not alone the healed wound or the level of amputation but rather the ability of the finished stump to tolerate an appliance which will restore the greatest portion of the normal function. To assure such a result it must be appreciated that

weight bearing and functional activity should begin at the earliest possible postoperative date. Comprehensive knowledge of the mechanics of artificial appliances is equally as important as a familiarity with operative technique if early weight bearing is to be made possible. Lastly the inhibitions to early prosthesis may be roughly divided into the mechanical, the pathological and the neuropathic. When present and remediable by surgery they warrant prompt intervention unless complicated by an infection prohibitory to open operation.

REFERENCES

- BEARCE: Amputation stumps and their adaption to artificial limbs. *Surg. Gynec. & Obst.* 1922 Apr.
 BENNETT: Lengthening of quadriceps tendon. *J. Bone & Joint Dis.* 1922 Apr.
 CARVER: Effect of war knowledge on teaching practice and after-care of amputations. *Lancet* 1921 Jan 15.
 LOCKWOOD: Amputations. *J. Am. M. Ass.* 1922 Oct 28.
 WILSON, P. D.: Dymc Amputation. *Surg. Clin. North America*, 1921 June.
 Idem: Early weight bearing in treatment of amputations of lower limbs. *J. Bone & Joint Dis.* 1922 Apr.

RESULTS OF X-RAY THERAPY OF MALIGNANT GROWTHS OF THE URINARY TRACT

By LEWIS T. MANN, M.D. NEW YORK
Assistant Surgeon Mount Sinai Hospital

IT IS the purpose of this report to set forth the palliative and final results obtained from the use of deep X ray therapy in the treatment of malignant neoplasms of the kidney, bladder, and prostate. The cases were observed at Mount Sinai Hospital, New York, from the service of Dr. Edwin Beer, and from the private practices of the members of that service. In the group of cases collected, there are some treated with deep X ray therapy alone, some by surgical procedures and X ray, others with radium and X ray, and still others with a combination of all three. Some of the cases were treated by the department of Radiotherapy at Mount Sinai Hospital and others, at various hospitals and in private practice.

The technique used was essentially the same in all instances, high power machines with the proper screening being used. The term "course" will be used to signify a full erythema dose received at the site of the malignancy. Because of the absorption of the rays by the overlying tissues, to the extent that only a part of the dose applied to the skin area reaches the part to be treated, it is necessary in treating lesions at a distance from the surface to apply full erythema doses to different skin areas, focussing the rays on the deep lesion. The lesion then receives a summation of all the doses which is equal to one full erythema dose. Skin areas which have received a full erythema dose are allowed to rest 3 months before further radiation is done.

KIDNEY TUMORS

The first group to be considered consists of malignant growths of the kidney, of which 11 cases have been collected. An abstract with treatment and results is given in Table I.

These results are no better than results obtained by surgery alone as shown by Hyman (5) in a recent review of the subject. He states that patients treated by X ray after operation, did not seem to do better and the percentage of lasting results is no higher than in the series of patients who were not treated with X ray. His cases came from the same service at Mount Sinai and are therefore a good control group.

For special consideration there is H. H., Case 1, a papillary carcinoma of the kidney. At oper-

ation the carcinoma was found to involve the medulla and to extend to the pelvis of the kidney, but it had not penetrated the capsule and there were no metastases. X ray therapy was given this patient after operation, and he has been apparently well since, nearly 4 years. Hyman (5) cites 5 patients alive over 4 years after nephrectomy for neoplasm, none of whom received deep X ray therapy. This brings up the question, how much influence the X ray treatment had on the result in this case.

Case 3, J. R., is also of interest. Although the carcinoma had penetrated the capsule, involved the lumbar tissues, and invaded the pelvis, it had not extended to the ureter. There was no recurrence during and after the X ray therapy in the lumbar region, but there was a recurrence in the ureter stump and bladder within 3 months. The latter did not respond to X ray therapy and went on finally to metastasize in the femoral and inguinal glands, with death of the patient after 9 months.

Mr. R., Case 10, had a hypernephroma, with extension into the perirenal tissues. Patient suffered a local recurrence 11 months after radium and one course of X ray treatment.

L. N., Case 5, had a renal carcinoma with perirenal extension. There was a recurrence in the ureter stump 5 months after X ray therapy.

BLADDER TUMORS

This group comprises a series of seventeen carcinomata and two papillomata. The latter did not respond to fulguration with high frequency current. While not pathologically carcinoma, they must be regarded as leaning toward malignancy because of persistent recurrence.

Although some authors state that there is relief of symptoms of dysuria, hematuria, etc., after deep X ray therapy, we find this to have occurred in three cases only in our series of seventeen. There were recurrences in 13 cases. Life has not been prolonged. The mortality is about the same as when no X ray therapy was used. There were no cures in this series.

Case 14, which was observed by Dr. Beer, is of special note. After cautery resection, there was a recurrence on the anterior bladder wall of small size, about 1 centimeter in diameter, situated

TABLE I—KIDNEY TUMORS

Name	Diagnosis	Operation Date	Radium	X-ray therapy	Result
H H	Papillary carcinoma of right kidney Capsule intact Bladder m	Nephrectomy 3/11/11	No e	11 treatments at St. Luke's 4-6 mm to 11 mm	Prognosis: No recurrence 11 months Chest X-ray negative Alive 3 years 4 months
M A	Adenocarcinoma of right kidney peritoneal glands extension and metastasis	Nephrectomy 3/15/11	None	23 treatments at St. Luke's 4/17/11 to 5/3/11	3/11/11 hemoptysis Chest X-ray shows metastases in right lung Jugular R t over tone 1 mm Electrolyte therapy 11/1/11 10/24 (11/11) renal metastases
J R	Papillary carcinoma of left kidney with extension into the lumbar vertebrae	Nephrectomy 3/11/11 3/11/11 3/11/11	None	10 treatments at St. Luke's 4/17/11 to 5/3/11	3/11/11 no recurrence in lumbar 2/11/11 Recurrence in vertebrae 11 months and bladder
E S	Papillary carcinoma of left kidney Cp	Nephrectomy 3/11/11	No e	10 treatments at St. Luke's 3/11/11 to 5/3/11	11 months recurrence in sacrum 11 months
L N	Papillary carcinoma of left kidney Cp	Nephrectomy 3/11/11	None	10 treatments at St. Luke's 3/11/11 to 5/3/11	11 months recurrence in sacrum 11 months
G K	Hypopharyngeal carcinoma of left kidney Renal	Nephrectomy 3/11/11	None	10 treatments at St. Luke's 3/11/11 to 5/3/11	11 months recurrence in sacrum 11 months
D K	Hypopharyngeal carcinoma of left kidney Renal	Nephrectomy 3/11/11	None	10 treatments at St. Luke's 3/11/11 to 5/3/11	11 months recurrence in sacrum 11 months
J F	Hypernephroma of right kidney	Nephrectomy 3/11/11	None	10 treatments at St. Luke's 3/11/11 to 5/3/11	11 months recurrence in sacrum 11 months
M R	Hypopharyngeal carcinoma of left kidney Renal	Nephrectomy 3/11/11	None	10 treatments at St. Luke's 3/11/11 to 5/3/11	11 months recurrence in sacrum 11 months
J B	Papillary carcinoma of left kidney	Nephrectomy 3/11/11	None	10 treatments at St. Luke's 3/11/11 to 5/3/11	11 months recurrence in sacrum 11 months

A. L.

Name	Cases	Prognosis of life	Results of X-ray therapy	Cases
Nephrom	6	6 to 11 months		7
Carcinoma	4	1 year		4
Hypopharyngeal	3	3 years		3
Metastases	3	3 years		3
Nephrectomy	4	4 years		4
Renal	4	4 years		4

most favorably for treatment by X-ray just beneath the abdominal wall in the vault of the bladder. A full course plus a knockout dose was given but a cystoscopic and pathological control a short time after showed the growth to be of the same size and the carcinoma cells to be unaffected. The growth was then treated with radium but the patient developed metastases about the left shoulder and died 13 months later.

When bare radium emanation seeds were placed in the tumor before X-ray therapy was initiated, the patients had either an increase of dysuria, hematuria, and frequency or no relief at all. This is due most likely to sloughing caused by using bare emanation seeds. Case 2 illustrates this. In two cases Case 3 and Case 7 bladder

carcinoma and in Case 3 in the group of kidney tumors in which there was a metastatic bladder carcinoma secondary to a renal carcinoma there developed metastases in the inguinal and femoral glands while these patients were receiving X-ray therapy. The glands were then treated with X-ray with no result and the patients died soon after.

Kilburn (6) reports a series of 11 cases of bladder tumors of which 5 were treated by deep X-ray only, 5 by surgery and X-ray and 1 by surgery, radium and X-ray. There were 3 patients with carcinoma of whom only one lived more than 1 year after X-ray therapy. Eight cases were reported as malignant papilloma of which 3 died within 1 year and 5 were alive from 6 months to

TABLE II—BLADDER TUMORS—ALL EXAMINED PATHOLOGICALLY

Name	Diagnosis and pathology	Operation and date	Radon	X ray therapy dates	Result
1 H B	Infiltrating papillary carcinoma of the bladder Posterior and lateral to sphincter	Supr pubic cystotomy 4 4 24	None	1 course Mt Sinai 4 15 24 to 6-9 24	No relief of dysuria hematuria and frequency of urination 4 Suicide June 19 4 after 2 months
2 H S	Papillary carcinoma infiltrating over left side of trigone and lateral wall	Suprapubic cystotomy 4 28 24	Radon seeds 2112 mc hours	3 courses at Mt Sinai 12-9 24 to 10 17 25	No alleviation of dysuria frequency urgency and hematuria at any time up to 10 17 25 Cysto-copy shows slough on left side of bladder Hard mass felt in prostate October 1925 prostate mass same size and hardness December 1925 condition same alive 1 year Cysto copy shows tumor mass throughout the entire bladder
3 N B	Papillary carcinoma of bladder infiltrating right and left sides	Cautery resection 2 17 22	None		7 16 24 small recurrence on left lateral wall fulgurated October 1924 Infiltration at lower end of scar
	10 4 24 infiltration at lower end of scar carcinomatous			10 4 24 to 12 16 24 2 course at Mt Sinai	12-6 24 suprapubic infiltration is larger and both urethral and femoral glands are involved while the prostate is nodular no relief of dysuria and frequency Died 3 9 25 months alive
4 I W	Infiltrating carcinoma of whole left side of bladder	None	None	1 course 8 5 24 to 8 18 24 Mt Sinai	No relief of symptoms Died October 1924 Alive months
5 A H	Carcinoma just within posterior urethra previous papillomatous of bladder	Suprapubic cystotomy and cauterization 4 3 20	None	2 courses 11 18 4 to 4 21 5	4 21 5 hematuria cystoscopy shows visible tumor X ray of spine metastases Alive 1 year
6 I K	Infiltrating papillary carcinoma on left side of trigone and over median lobe of prostate Tumor felt to be infiltrating by rectal examination	None	None	3 courses 4 10 25 to June 19 5	6 25 25 hematuria is gone and dysuria less but cystoscopy shows the growth to be of same size but somewhat blanched Was fairly comfortable until he died on 10 25 after 6 months
7 R T	Infiltrating carcinoma behind trigone on left side of bladder	Suprapubic cautery excision 9 5	None	1 course 2 28 25 to 4 1 25	4 1 25 inguinal glands involved
		Excision of gland en masse 4 10 25	None	2 course 5 10 25 to 6 25 25 Mt Sinai	Did not halt growth Died July 1925 5 months
8 S B	Infiltrating carcinoma submucous mostly on right side of bladder	Suprapubic cystotomy 10 24	Radon seeds	1 course 12 10 24 to 1 5 25 Mt Sinai	1 27 25 died of intestinal obstruction due to loop of intestine becoming adherent to bladder No relief of dysuria 1 month
9 H C	Papillary carcinoma of bladder	None	None	Part of 1 course 5 7 24 to 5 21 24 Mt Sinai	5 21 24 so weak that he is unable to come for treatment Evidently died Could not trace
10 C K	Papillary carcinoma of bladder	Previous suprapubic cystotomy	None	2 courses at French Hospital during July 1922	February 19 1 has had no relief of dysuria and hematuria which is the same as before X ray treatment Cystoscopy shows tumor present October 1922 8 months Died February 1923
11 C S	Papillary carcinoma of bladder infiltrating	Suprapubic cystotomy with implantation of 10 10 24	Radon seeds	1 course at Mt Sinai 10 27 24 to 12 10 25	Died 12 10 25 of intestinal obstruction due to loop of intestine adhering to bladder where the carcinoma had infiltrated through No relief of symptoms 3 months
12 H F	Papillary carcinoma of bladder	Resection was done previously	None	2 courses Dr S 4 12 24 to 6 24 24	6 24 24 large recurrence on right side of bladder—by cystoscopy 8-6 24 cystoscopy shows same condition There is no hematuria
13 H S	Infiltrating carcinoma of bladder on right lateral wall about 3 cm in diameter	Suprapubic cystotomy with implantation of 5 10 24	Radon seeds 3000 mc hours	2 courses Dr S August to October 1924	September 1924 cystoscopy showed large recurrence 10 3 24 died No mention as to relief of symptoms 2 months

TABLE II—BLADDER TUMORS—Continued

Name	Diagnosis and path. logy	Operation and date	Radium	X ray therapy dates	Result
14 L. F.	Papillary carcinoma in left of left ureteral wound abo 1.2 cm in diameter	Cystectomy October 1920			1. 22 cystoscopy shows growth th same as d pathologistally the cancer cells are unaffected.
	Recurred nant or bladder wall Recurrence 3 m in diameter Juary 1922		Radium after X ray	J n ary, 20 1 1 course and a knock out dose Dr S	I be ary to 3 meta tas about left should r Died February 1923 3 3 r and t m nth
15 Mrs L.	Carcinoma infiltrating behind the right ureteral wall	Excised 12 2 24	Radiation Juary 1925	1 course Dr L. ending Oct ber 1925	8-1 25, cystoscopy shows a nod le i th right wall of th bladder 1 24 25 cystoscopy shows nodule u fected No me t on i symptoms
16 M. C.	Infiltrating carcinoma over trigone and up th lateral walls	Super pubic cystotomy Apr 19 1925 Broad St. Hosp	No c	1 course 7 7 25 to 8 20 25 2 course September 1925 t December 10 5 Mt S n	December 1925 very ill F equency d dys ris per stent and ve y severe
17 A. S.	Papillary carcinoma of bladder		No	14 courses t Post Grad te Hospital June 10 5 to July 1925	A gust 1925 cystoscopy show tu m pres t Hemat u.
18 M. G.	Bladder Papilloma. Numerous small growths	Fulgurated 10 21 to November 1924 with recurrences	No	1 course Mo tefin No em ber and Dec mber 19 4	7 25 Cystoscopy shows n merous growths 4 20-25 cy toscopy show tum rs 9-17 5 cytoscopy sh ws to recur rnces
19 M. S.	Papilloma of bladder stenose	Fulgurated October 1925 to December 1925 with recurrences	No c	1 course Mt. 4 nat 5 10-24 to 7 2 24	7 24 24 symptom free Could ot t acc.

Analysis

Carcinoma	Cases	Deaths	Cases
Papillary	17	1st year	10
Infiltrating	6	Second year	1
Indurating	11		
Metastases	10		
Operated	0	Alleviation of Symptoms	
Unoperated	5	Dys uria relieved	3
Radium	9	Hematuria relieved	1
Papilloma	1	No relief of symptoms	1
		No record	4
		No effect on t moro recurrence as observed by cystoscopy c post	
Prolongation of life—care nomata		No m tem d path logical exam t n but w th persi t t symptoms	3
6 months t 1 16	17	No cy toscopy c tam t n but w th persi t t symptoms	4
7 mo ths to 1 y	7	Prof agation of life—pap il mata	1
to 1 Year	3	Recurrence	1
Unable to trace	1	Unable to trace	1

1 year and 9 months after deep X ray therapy was initiated. Only one had no recurrence after 2 years and only two were free of recurrences within 1 year 5 time

Dr G G Smith, in discussion reported a case of a patient with bladder carcinoma in which viable cancer cells were found 5 months after a course of deep X ray therapy

Morton (3) reports that results are not favorable in malignant disease of the bladder, because in nearly all cases the condition is very far advanced and he considers infection present an obstacle to the success in the treatment because a successful result depends upon a healthy and vigorous reaction in the surrounding tissues

Pfahler (9) states "While some brilliant results have occasionally been obtained in malignant disease of the viscera for the most part radiation therapy is as unsatisfactory as other methods of treatment in such cases"

Waters (10) states that 25 per cent of bladder tumors, due to position or extent which render them inoperable or not suitable for radium offering a chance for cure should be treated by deep X ray therapy, which seems to offer help. He goes on to say that it is too early to draw any definite conclusions but that it can be positively said that X ray therapy is definitely beneficial and has a specific influence on certain types of bladder tumors. He states that it is his experience that X ray therapy will cure a certain number of bladder carcinomata which are unsuitable for other forms of treatment. He gives neither case reports nor a statistical review in his paper

Heuser (4) reports the results from a series of five inoperable bladder carcinomata. Three were alive for more than 1 year, and two for 8 months after X ray therapy. They continued to do well and were without evidence of recurrence. The

TABLE III—PROSTATIC CARCINOMATA

Name	Clinical findings	Pathological examination	Radium	X ray therapy dates	Result
¹ S D	Both lobes stony hard nodules on left side marked frequency no obstruction and urgency no metastases 10-4 21 no hematuria	Not made	Element through permeal needles and urethra Montefiore 3 20 22	11 treatments at St Luke's 12-9 21 to 3 13 22	3 15 22 no relief of frequency and urgency from X ray therapy April 1925 has been symptomless since radium therapy but prostate feels the same as initially Alive 4 years
² A C	Both lobes hard and large irregular and nodular Left larger than right Marked frequency urgency and dysuria No obstruction or hematuria	Not made	None	3 courses at Mt Sinai 6 27 24 to 4 27 25	Relief of symptoms from June 1924 to June 1925 but prostate feels the same 10 25 general condition is very poor Marked dysuria and frequency Tumor is larger metastases in pelvis and spine Alleviation for 1 year
³ M F	Both lobes hard irregular and nodular left larger than right Obstructive symptoms with dysuria and great frequency Permanent supra pubic drainage December 1924	Not made	None	3 courses at Mt Sinai 11 11 24 to 6-6 25	6-30 25 bladder irritable Pain in bladder Losing weight Tumor is the same size December 1925 prostate feels the same Pain in bladder is very severe going down hill No alleviation
⁴ H B	Prostate large hard and nodular Left lobe larger than right No obstruction but has dysuria and frequency	Specimen unsatisfactory Perineal puncture	None	3 courses at Mt Sinai 5 17 24 to 8 16 24	6 11 24 marked dysuria and frequency Losing weight Prostate feels the same Died 12 7 24 7 months
⁵ M L	Right lobe stony hard and enlarged No obstruction Marked frequency every 1/2 hour	Tissue taken unsatisfactory Perineal puncture	None	3 courses at Mt Sinai 5 12 25 to September 1925	6 30 25 symptom free Prostate is smaller 10 24 25 prostate is larger and hard Marked frequency
⁶ I D	Right lobe larger than left both being hard and nodular Obstruction	Specimen removed through supra pubic cystostomy is adenocarcinoma of the prostate	None	1 course Dr S 9-21 22 to 10 4 22	Died May 1923 7 months
⁷ E G	Prostate is not enlarged but contains hard nodules The right lobe is larger than left No obstruction Dysuria 10-16 22	Not made	None	2 courses Dr S Up to November 1922	November 1922 pain is less May 1 1923 prostate is smooth but tumor has extended over the vesicles August 1923 X ray shows multiple metastases in the lumbar spine and femora Died June 1924 1 year and 10 months
⁸ N E	Prostate is hard and nodular Nodule in right lobe at the apex and higher up on the left Frequency but no obstruction	Not made	None	2 courses Dr S August to October 1923	10 16 23 the prostate feels the same Died 3 25 25 1 year and 7 months
⁹ P Z	Prostate hard large and nodular since November 1924 No obstruction	Not made	None	1 course at Roosevelt Hospital May 1925	Died September 1925 5 months
¹⁰ M C	Prostate stony hard in center and on right perforating bladder Pelvic glands involved	Adenocarcinoma of the prostate Cystoscopic biopsy	At Johns Hopkins Element 1921	1 course by Dr Chas Waters Johns Hopkins during 1921	Pain relieved No effect on metastases Died January 1922 3 months
¹¹ T R	Prostate not very large No nodules felt per rectum hematuria for 2 months and marked frequency with terminal dysuria	Nodule removed by suprapubic cystostomy 8 15 25 Carcinoma of prostate	1500 mc hours radon seeds	1 course ending 9-5 25	10 5 25 frequency persists with terminal dysuria 11 14 25 induration in suprapubic area incised and tissue examined Reported as metastatic carcinoma 9300 mc hours radium pack applied
¹² E S	Large nodular irregular mass in prostate and vesicles Partial obstruction Frequency every 5 to 10 minutes day and night Pallor	Not made	12 7 mc radon bare tables 5 19 24	7 courses from 6 21 24 to 11-9-25	December 1925 general condition improved Weight gained Color better No frequency—day 3 to 4 times night 1 Prostatic mass unaffected may even be larger Obstruction relieved 1 year and 6 months

Analysis

Number of cases
Diagnosis by clinical methods 12
Positive pathological diagnosis 8
Negative pathological diagnosis with positive clinical diagnosis 4

Results

Prolongation of life
Less than 6 months 10
6 months to 1 year 8
1 year to 2 years 6
2 years or more 1
4 years or more 1

Deaths

Less than 6 months 2
6 months to 1 year 2
1 year to 2 years 2

Cases

2
2
2

Relief of Symptoms
Obstruction relieved in 1 out of 3 cases
Dysuria and frequency relieved in two cases for over 1 year but only temporarily in the others

The tumor mass was not made smaller or softer in any of the cases but grew larger in some notwithstanding the fact that X ray therapy was being used
Metastasis occurred in four instances after treatment
Cures none.

latter statement is based on the fact that none had hematuria. This is his only criterion of cure since there was no cystoscopic control in any of his cases. In discussing this paper, Gooseman reports nine cures in a series of fifteen bladder tumors treated by X ray only. Cystoscopic control showed no evidence of recurrence in these cases. He gives no pathological diagnosis as to whether these tumors were malignant or benign. Neither does he state how long after treatment cystoscopies were done and how long patients were free from recurrence.

Barringer (2) says that he has been disappointed with results of deep X ray therapy, and that in three cases of infiltrating carcinoma of the bladder the tumor grew while and after deep X ray was applied and that in most cases it was impossible to control bleeding by deep X ray therapy.

Martin (8) reports an ulcerated carcinoma the size of a dime found at the fundus of the bladder. X ray therapy was given by an experienced radiologist. There was a brief period of symptomatic improvement followed by extremely severe bladder symptoms and rapid decline. The patient died at the end of 1 year and the tumor on his logical examination was found to be very malignant. He believes that it is rare for a carcinoma with such a clinical picture to cause death so quickly.

PROSTATIC CARCINOMATA

This group is made up of twelve cases; a summary is given in Table III.

As far as actual cure of prostatic carcinoma is concerned, all authors agree that X ray therapy is of no use, but state that life is prolonged and the symptoms alleviated.

Kidd (3) believes that deep X ray therapy can do little in malignant disease of the prostate and that it does not have a marked effect on the cancer cells but that it does prolong life and gives palliative relief of pain, hemorrhage and urinary frequency.

Barney and Gilbert (1) say that X ray therapy will often relieve pain and inhibit growth of the prostate and that it is indicated in all cases of prostatic carcinoma.

Morton (3) reports no cures in malignancy of the prostate but states that there was noted improvement in many cases in both local and general conditions.

From our analysis, it would seem that there is no cure of prostatic carcinoma by deep X ray therapy. We cannot agree altogether that life

is prolonged as our figures are not so different from those seen when no X ray treatment is used. In two cases symptoms of dysuria, hematuria and frequency were relieved for some time while in the other 10 cases relief was but temporary or there was none at all.

There was no permanent decrease in the size of the tumor mass in any case in the series. Although none of the growths became smaller or softer, it is to be noted that none grew rapidly after X ray therapy was started, and obstruction to urination did not occur. Therefore deep X ray therapy should be used in treatment of cancer of the prostate not with hope of cure, but as a palliative measure.

CONCLUSIONS

1. Cure of malignant growths of the urinary tract by deep X ray therapy is a very infrequent occurrence.

2. Alleviation of symptoms occurs almost as infrequently as cure and is in most cases temporary.

3. There does seem to be greater prolongation of life in cases treated by deep X ray than in cases not so treated.

REFERENCES

1. BARNEY D. and GILBERT S. C. Some clinical observations on cancer of the prostate. *Boston M & S J* 1924 cxc 10.
2. BARRINGER B. S. Radium removal of carcinoma of the bladder. See discussion. *J Urol* 1923 xiii 174.
3. FRIZZ V. S. WEBSTER D. MORTON R. and others. Discussion on radiotherapy and X ray therapy in diseases of bladder and prostate. *Proc Roy Soc Med London* 1925 xvi sect vol 15.
4. HEUSER CARLOS. The results obtained after two years application of deep roentgen therapy in cases of cancer of the prostate and bladder. *Am J Roentgenol & Rad Ther* 1924 xi 23.
5. HYMAN ABRAHAM. Clinical and surgical aspects of renal neoplasms. *Surg Gynec & Obst* 1923 xli 293.
6. KILGURY I. N. Deep roentgen therapy in malignant tumors of the bladder. *Boston M & S J* 1915 cxcvi 21.
7. LEGUEU. Suite de la discussion sur cancer de la prostate et radium. *J d'urolog méd et chir* 1923 xi 387.
8. MARTIN. Accélération probable de la marche d'un cancer de la vessie sans l'influence de la radiothérapie ultra pénétrante. *J d'urolog méd et chir* 1925 xiv 3.
9. PFÄHLER G. E. Radiation therapy in malignant disease. *Surg Gynec & Obst* 1925 xli 443.
10. WATERS C. A. The new type of high voltage roentgen therapy in bladder carcinoma. *Am J Roentgenol & Rad Ther* 1924 vi 19.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D.
ALLEN B. KANAVEL, M.D.

Managing Editor
Associate Editor

WILLIAM J. MAYO, M.D.

Chief of Editorial Staff

OCTOBER, 1926

THE DANGER OF SEPSIS ABOUT THE LIPS

DURING the War, I was treating a young officer for a wound in his arm. He cut a small septic pimple on his lip while shaving, acute general sepsis followed, and he died in a few days.

When visiting Amsterdam in the summer of 1925, I saw with Professor Noordenbos and a local practitioner, a patient with a small carbuncle in the region of the lower lip. The carbuncle had been partially opened and some pus was escaping from wound. She developed acute thrombophlebitis which reached the cavernous sinus. The temperature was high, the eyeball on the infected side was protruding, and at the time of the visit, she was passing into a moribund condition.

On my return to Dublin, my colleague, Dr. Lane, told me of a case which he had just seen, in which a septic focus in the chin was followed by rapid sepsis and death.

A fourth case I was asked to see during the present year.

These four cases emphasize the fact, so rarely commented on in recent text books,

that septic foci in the neighborhood of the lips should be regarded with fear and respect.

As a result of the first case mentioned, a communication by Martin¹ on "Infections of the Face or Lips" was referred to in the *Medical Annual*, 1925. The teaching is recalled that infections of the face may prove serious on account of the anastomosis of the superior ophthalmic vein with the facial at its origin at the root of the nose. Thrombophlebitis reaches the cavernous sinus by this channel.

There is no reason to suppose that the infections are of unusual violence, and we know that lacerated and contaminated wounds of the face heal with unusual rapidity. Nevertheless, spreading thrombophlebitis follows furuncles of the lip more frequently than elsewhere.

There is a rich venous plexus in the lip, and under certain conditions the products of septic infections extend from this venous plexus into the collecting venous trunks, which in turn flow into the facial vein at the level of the nostril or lower border of the orbit. The rest which is essential in the case of septic thrombophlebitis elsewhere, cannot be obtained in the case of the lips, and thus infected thrombi are pumped onward.

Martin states that case history after case history tells the same story. A small furuncle with redness and swelling, usually of only one or two days' duration, is pricked or squeezed. A small wound may be made and enlarged with a blunt instrument. After each incision the patient grows worse. The small wound made in the connective or muscular tissues of the lip is almost certain to sever or

¹Ann Surg. 1925 July 13

nick one of the small veins. The blood escapes only partially, and this stagnated blood in an area which is infected furnishes an excellent culture medium for bacteria. It has been shown that under such conditions the potency of staphylococci is increased enormously. Early incisions into septic foci about the lips are dangerous and the danger is increased if the small exit thus made is packed with gauze to prevent bleeding. Local anæsthesia should never be used. The rule should be to wait as long as possible and then when incision becomes necessary, to use a sharp knife and above all avoid pressing and squeezing, or the pushing of blunt instruments into the septic tissue in the search for pus.

The treatment in the early stages should consist of injections of colloidal manganese or stock vaccines as recommended by Spaar.¹ Locally the application of magnesium sulphate paste as recommended by the late A. E. Morrison is indicated.² The paste is so hygroscopic that if exposed to the air it rapidly absorbs moisture and becomes fluid. Applications of a 20 to 40 per cent solution of magnesium sulphate as recommended by Alston³ may be applied as an alternative and a sucking glass as recommended by Bier may be found useful.

Recent reports on the effects of intravenous injections of mercurochrome suggest that a trial at blood sterilization might be worth while, if the infection shows signs of dissemination.

Lanz⁴ relates some experiences in connection with furuncles of the lip while he was working as one of Kocher's assistants. One of the assistants developed such a furuncle, and during the absence of Kocher it was incised by one of the other men. Four days later the patient died of pyæmia. A day later a second assistant who had attended the patient,

developed a sore throat, three days later he also died of pyæmia. *Staphylococcus aureus* was found on culture. "Furuncle of the lip" says Lanz "is to be considered a serious condition from the very first moment."

The note of danger sounded by the old writers has been forgotten in recent years. Treves⁵ states that carbuncle of the lip is always a formidable condition and not infrequently causes death. The clarity of his description of the normal course of the condition is characteristic. He concludes by saying that "unfortunately, however in many cases infective thrombophlebitis of the veins of the part occurs spreading from the rootlets of the facial vein to those of the ophthalmic veins (the free intercommunication between these veins near the inner angle of the eye is well known), thence involves the intracranial blood sinuses and gives rise to septic meningitis, septicæmia or pyæmia."

The late Mr. E. H. Taylor⁶ points out that the facial vein has two very important communications which bring it indirectly into connection with the cavernous sinus. The first is the ophthalmic vein, the second is the deep facial vein which runs to the pterygoid venous plexus. This latter is connected with the cavernous sinus by veins which traverse the foramen ovale. He states that these connections are of considerable importance on account of the serious consequences which may follow in the event of their becoming affected with spreading thrombosis in the course of acute septic processes. Under such conditions infection may spread intracranially by way of the ophthalmic vein or by the pterygoid venous plexus setting up an acute septic thrombosis in the cavernous sinus, and meningitis. The fact that the

¹Med. Ann. 1923

²B. t. M. J. 1924 73

³Alto. B. t. M. J. 1914 765

⁴Surg. Gynec. & Obst. J. by 1911 Abstract

⁵System. of Surgery 1896 vol. 1

⁶Applied Anatomy 1914

angular, facial, and ophthalmic veins have no valves is also mentioned

The high mortality in these cases of carbuncles of the face located in the region of the lips is due to the involvement of the labial venous plexus. The spread of infection is brought about by the following anatomical conditions: (a) The skin of the lip is very adherent to the underlying muscles, (b) there is little or no connective tissue or fat beneath the skin, (c) there is a rich venous plexus both superficial and deep, in relation to the muscles of the lip, and (d) the collecting trunk into which these pour their contents, empties freely into the facial vein. Septic thrombophlebitis is thus readily established, motion and trauma does the rest.

W I DE C WHEELER

POSTGRADUATE STUDY

IN THE early days of our medical history in the United States postgraduate study meant going to the European clinics. This condition has gradually changed, and today men in Europe consider a medical education incomplete without a visit to America, and we feel the same urge to go to Europe. It is a proper feeling.

During the last two decades, because we have broad minded medical men, certain direction has been given to postgraduate study. Opportunities for postgraduate study have been created, first in individual clinics and later by higher institutions of learning. The knowledge of these opportunities has gradually become disseminated throughout the country, and they are being used more and more. With conditions in his own country the average man is fairly conversant, but with reference to foreign clinics, he is still largely ignorant.

There are two classes of men concerned

First the young medical man, having completed his medical schooling and a period of interne work, comes to a point where his path is more or less narrowed in the field of medicine. He fits himself as well as he is able and wants to finish with some postgraduate work in Europe.

The second class of man is the practitioner who was unable to do this, but who all the time has kept in his subconscious mind the desire some day to do it. In going he has a three-fold handicap to meet. First, while away, his income is cut off and his overhead goes on. Secondly, there is the expense of the trip and as the third handicap there is the loss of practice which it will require some time to regain. To men in clinics or in association with other men this is not so important. However, the trip is least expensive and most easily accomplished when the young man has just started in practice.

The trip abroad must have definite direction. Know what you want to get and where you can obtain it. A man may find out what he wants by knowing what is being done. This information is to be secured by asking medical men conversant with the medical situation in Europe and by following the medical literature.

The medical men in Europe as well as in the United States, especially in the universities take vacations during the summer time, and still many of our men go over during this period to find the clinics minus their chiefs. Find out if the men you are interested in are going to be working.

The matter of language is always important, although our European colleagues can usually all speak English. A knowledge of French and German is very convenient and helps a great deal in the daily life and in comprehending the literature.

For the first trip a period of six months or a

year should be allowed for becoming thoroughly familiar with the clinic or clinics and for securing a general orientation of the medical field. Later trips may be made of a week or a month's duration when contacts have been made and as much secured in this time as previously in 6 months.

The whole day will not be occupied with things medical. A great many opportunities

are offered in the realm of music, painting, sculpture, history, architecture, and drama and the farther away from home it is, the greater the interest.

With definite aim and planning, instead of the 'hit and miss' or "trial and error" method, a postgraduate trip can be made that is both interesting and instructive.

ERWIN R. SCHMIDT



DINI CROSBY
1800-1873

MASTER SURGEONS OF AMERICA

DIXI CROSBY

ONE of the most beautiful sights, humanly speaking, of my college life at Dartmouth from 1862 to 1866 was to see often in the streets of Hanover, Dr Dixi Crosby then over 60, and already ageing a little, leaning affectionately on the arm of his celebrated son, Dr Benning Crosby, as they walked along the streets or across the college campus talking devotedly to one another. The old doctor was a short, compact, well dressed man, firm on his feet but rather ponderous in his gait. His head was large, he wore a curly reddish beard, shaggy as if never a comb had touched it, and his hair reached to his coat collar behind. His upper lip was clean shaven "so that," as he said, "no hair should obstruct his voice in his lectures to the students." His face was attractive, he talked a good deal as he walked, and the whole effect of his appearance was majestic and impressive.

As for his son "Dr Ben" as he was called, he shall be mentioned later. Meanwhile let me again recall the wonderful friendship that existed between father and son as men and as physicians.

Just before the child of Dr Asa and Betsy Hoyt Crosby was born February 7, 1800, at Sandwich, New Hampshire, there was a friendly dispute concerning the possible sex of the infant, the father wanting a boy and the mother a girl. When it turned out to be a boy, the happy father shouted "Dixi" (Latin for "I told you so") and Dixi he was named.

He studied in the village schools, and then went into business travelling as far south as New Orleans but he failed from lack of experience. He studied then with his father, who was at the time practicing at Gilmanton and in the winters he attended the lectures at the medical school at Dartmouth where he was graduated in 1824.

Even as a medical student he had a large amount of surgical audacity, for in one instance in spite of the protests of the older but timid attending physicians, he amputated successfully the gangrenous leg of an apparently moribund patient. In another instance, he made use of an ordinary carving knife, a carpenter's saw, and a chisel to amputate a leg, high up, and was again completely successful. How much truth there is in the story of these youthful outbursts of bold and fearless surgery is actually unknown, but from considerable evidence at hand, there is no doubt that in them lay the germ of that surgical boldness which was soon to make itself known throughout the State.

Dr. Crosby practiced in Gilmanton with his father for 10 years, and finally when called to the chair of surgery in 1838 at the Dartmouth School of Medicine at Hanover he settled in that village for the rest of his life. His practice in Hanover was large for many patients were attracted by the high reputation of the medical school while his personal ability spread far around for many miles.

He occupied the chair of surgery for many years then gradually retired from that in favor of his son Benning but continued as professor of obstetrics and diseases of women until 1870 when he was retired as professor emeritus until his death 3 years later.

As a lecturer he talked very plainly and to the point and had a gift of description that held the attention of his scholars. Some of his axioms were "See with your own eyes feel with your own fingers use your own judgment, and do not be the disciple of any one man. Operate not quickly but surely so that your work shall be for the benefit of your patients."

Among the novelties which Dr. Crosby suggested was one for reducing dislocation of the thumb by bending the phalanx backward forcibly and then by pressure from below the bone was set quickly into place. At one time he was known as 'elbow Crosby' from his ingenious method of breaking up adhesions in that joint while his brother Josiah was known as 'sticking plaster Crosby' for his frequent use of that material in every case of fracture.

Although Dr. Crosby performed some famous operations for the era in which he lived he might be called a careful rather than a brilliant operator. He said once upon a time in my hearing "An operation gentlemen is soon enough done when well enough done." He learned all the new methods of practice by frequent visits to the metropolitan hospitals he went to Boston to see just how ether was used and later on to study chloroform which he preferred in his surgical practice when he could have the services of a skilled anesthetist like his son Benning. No statistics of his operations have been preserved but he had the reputation of doing more surgery in his active years than any other man in New Hampshire.

He was the cynosure of all eyes at the meetings of the State Medical Society, was honored with every office within its gift and was twice chosen president. He made a dignified presiding officer. He spoke almost invariably at the meetings, all of which he attended after his election as a member in 1826. Although on each occasion as president he may have delivered an address no precise record of the items which he discussed has been preserved. Besides this a careful study of the records of the State Society shows that set papers were rarely read most of the meetings being occupied with the exhibition and discussion of the proper treatment of cases.

Among his papers we have discovered one "On Tumors of the Pelvis" and another on "Trusses." He exhibited in 1835 the case which made his name noted

in American surgery in which in March of the next year, after a bloody operation and before the days of ether he removed an enormous osteoma involving the clavicular shoulder joint and scapula amputating all the parts involved. The operation was so completely successful that when shown to a crowd of admiring surgeons in June following the patient who had been an emaciated skeleton of 80 pounds was seen to be "a monstrous healthy fellow, weighing over 200 pounds." This operation was first performed by Ralph Cumings an English Naval Surgeon, in 1808 and reported by A. Copland Hutchinson in the *London Medical Gazette*, 1829 to 1830, v, 273.

No account of the life of Dr. Dixi Crosby would be complete which failed to mention his extraordinary law suit which lasted 9 years and ended in his acquittal. It was extraordinary, because it was the first time in this country that a consulting surgeon was ever sued, and it was the first suit in which so long a period elapsed after the date of the original visit before proceedings were completed.

The case ran this way. Early in 1845 a man was covered with gravel falling in a pit, and he was taken out with a broken leg. Dr. Crosby was called as consultant and advised the use of Gibson's splints. When the splints were ready the next morning he applied them properly, as he considered and never saw the patient again. He was finally sued because an abscess and gangrene supervened with shortening of the leg. At the first trial in 1853 8 years later a verdict against him was found in the amount of \$800. He carried the case to the higher court obtained a new trial in 1854 and was acquitted.

This end result sounds simple enough nowadays but it attracted attention throughout the entire nation, because, as we have said before, it was the first case in which a consulting surgeon had ever been sued for malpractice, and when it was over, Dr. Dixi received congratulations from the entire medical profession in this country, and many kind letters from Europe.

We may sum up the career of Dr. Crosby by saying that he was a general, humane man, a faithful adviser, a cheerful man to have at the bedside, and in his prime he was the leading surgeon in his State. He was proud of his State. He was proud of his temperance doctrines and he did much to prevent the sale of intoxicating bitters to the boys in Dartmouth College. Well do we remember his opposition to that vile concoction known as "S. T. 1860" which was peddled about in the streets of Hanover in bootlegger fashion to the students when they wanted to go on a spree.

In 1827 Dr. Dixi Crosby married Miss Mary Jane Moody of Gilmanton. They had two sons, one the very celebrated Alpheus Benning Crosby, and the other who after long training to become a lawyer, studied medicine and was a first rate surgeon, Dr. Albert Crosby of Concord, New Hampshire.

It seems to us that we cannot possibly end any notice of Dr DIXI Crosby without adding a few words concerning his very remarkable son, Benning other wise known as "Dr Ben," one of the most brilliant physicians ever practicing in New Hampshire As an operator, a lecturer on surgery, a bedside teacher, a lecturer on anatomy and public health and as a eulogist of men who had gone before him, he seems to us to have been unique

Dr Ben was born at Gilmonton on Washington's Birthday, 1832, and he died in Hanover August 9 1877, in his forty sixth year, a worn out man He was graduated at Dartmouth in the Class of '53 studied at the Dartmouth Medical School with his father where he was demonstrator and spent a year as interne at the United States Marine Hospital at Chelsea Massachusetts, where he saw innumerable cases of fracture frost bite pneumonia, and syphilis He was graduated at the Dartmouth School of Medicine in 1856 and started to practice with his father He gradually took upon himself all of the night work, and they divided between them the long journeys around Hanover

With the outbreak of the Civil War Dr Ben was appointed surgeon of the First New Hampshire Regiment and in May, 1861 at Poolesville, Maryland, he personally drew the plans and superintended the building of the first complete military hospital ever constructed on the pavilion plan

His service in the Army did not last so long as he desired because his father needed him and his genial presence in the medical school at Hanover Three years later, in 1866 he was a professor of surgery at Dartmouth and delivered entire courses of lectures on Surgery and operated on all cases offered to him at the University of Vermont at the University of Michigan at the Long Island College Hospital at Bowdoin and at the Bellevue Hospital and Medical School in New York He declined an invitation to the chair of surgery in the New York School of Medicine and on the death of Dr Pancoast he was urged to become professor of anatomy in the Jefferson Medical College in Philadelphia This crowning honor of his life he also declined because he could not leave his other engagements nor spare the time It must however, have been a tremendous responsibility to follow out as Dr "Ben" did one course after another, to operate upon so many patients at various schools to leave them with others for after care and then to return to Hanover to go the rounds of the patients whom his father retained

In addition to all these labors he delivered at the Cooper Institute a set of public health lectures, the most attractive of which were on "The Hand" and "The Foot" His most valuable medical papers were on, "Foreign bodies in the knee joint" "A successful case of ovariectomy" (done when that operation was rare), one on "Abscesses," and one on "Diabetes" all with a wealth of illustrated cases, and last of all a charming paper entitled "A Month in a Volunteer Camp

The crowning paper of his career was his address as president of the State Society in 1877 In a brief two months after this, his work ended forever He had survived his beloved father about four years only

As a surgeon he was dexterous, his results were good, and this speaks more plainly than rapidity or style He did many lithotomies, amputations at the hip, treated endless cases of necrosis, and had throughout the country the reputation of being a great surgeon

As a public speaker he possessed the exquisite art of extemporaneous speaking to perfection He possessed a large fund of anecdotes, could tell a story to the point, or cap another His voice was clear and resonant, and whenever a speech was wanted for an occasion or for an anniversary, everybody said "Ask Dr Ben "

As a teacher, he possessed the rare gift of making friends with the students, of attracting their attention with genial anecdotes and then pushing home his important points of discussion

Dr Ben Crosby married in July, 1862, at Baltimore, Miss Mildred Russell Smith daughter of Dr William Smith of Galveston, and brought her to Hanover where they built up a center of widespread beautiful and bounteous hospitality Nor did they forget to include within it college boys living far from home and sadly in need of social correction of their youthful enthusiasm

To this wonderful hospitality I personally owe many of the little recollections which have crept into this paper, and had I been less thoughtful of the pretty girls in the circle at Hanover, and thought more of good old "Dr Dixi" and of dear "Dr Ben" and his charming wife, this paper might have offered a greater list of the attracting personalities of these two genial physicians

When Dr Ben died, all Hanover mourned Many physicians throughout the country were sad, young men who had listened spellbound to his lectures, others who had followed him enthusiastically from bed to bed in hospitals, older men who knew what good surgery really was, those who knew him as a friend, merely, and as a public speaker lamented his sudden, and as they all said, uncalled for departure from the scenes of his useful life

J A SPALDING

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD FEBRUARY 19 1926, DR H S HILLIS, PRESIDING

A CRITICAL REVIEW OF FIVE HUNDRED OBSTETRICAL CASES

Dr Carl Henry Davis read a paper entitled A Critical Review of Five Hundred Obstetrical Cases (See p 519)

DISCUSSION

DR R A SCOTT I would like to ask what preparation he gave these patients before he did the classical cesarean section

DR N S HEANEY Dr Davis tells us what can be done by good conservative conscientious obstetrical practice the patient's interest being taken into consideration and the case treated as an individual instead of according to some method I believe along this line lies the advance in obstetrics Dr Davis and I were brought up on the Milne Murray forceps Since however I have become practiced in the use of the Kjelland forceps I have discarded the Milne Murray

DR D A HORNER Dr Davis in calculating the morbidity has considered only those cases which have shown a temperature over 100.4 degrees F I do not know whether he has available any statistics which give the morbidity for patients who have gone home for the many with torn cervixes relaxed perineums prolapsed uteri broad ligament indurations and with various other pathological conditions which followed labor I have seen other reports in which these conditions were treated as essential morbidity temperature alone is not sufficient

DR LOUIS RUDOLPH Dr Davis made some comments relative to the increase in weight during pregnancy What was the average gain in this series? I have found an average gain in weight of 22 pounds and in 3 cases the gain in weight was from 45 to 65 pounds In these 3 cases there was marked general obesity which I believe was due to some endocrine disturbance and not to any pathological condition associated with pregnancy Labor was normal in each case and the weight became practically normal after labor I would like to ask Dr Davis if he has had any experience with this type of obesity

DR RUDOLPH W HOLMES Eighteen fetal deaths in 500 successive labors is a phenomenally low record This is of greater import when we appreciate that Dr Davis has counted all deaths within the first month of life The League of Nations is standardizing methods of computation of vital statistics so

that the world statistics will be on comparable bases it is very desirable that physicians should likewise have common bases for estimating their mortality rates Most physicians compute death rates on the basis of 2 puerperal weeks in the hospital others think 1 week sufficient naturally the shorter the time of postnatal life used in the estimate the lower will be the death rate If Dr Davis had used a period of 2 weeks his mortality would have been materially less than his 3.6 per cent

Some might think the frequency of cesarean section—16 in 500—is high but when we accept the fact that a specialist depends on referred work for his abnormalities it is a conservative estimate Professor Tottenham of Hongkong lately from Dublin published recently a paper on American obstetrics In one teaching hospital he gave the incidence of cesarean section as 1 in 6 in another 1 in 12 again 1 in 14 On the basis of the first institution Johns Hopkins Maternity would have had some six thousand suction instead of the ptery 254 they did have in other words some teaching hospitals apparently are specializing in cesarean sections with indications so loosely drawn that they are the figment of the imagination For a teaching institution to have such a high incidence of laparotomized deliveries is pernicious practice and indefensible

For many years I have taught my students that no man has a moral right to perform cesarean sections unless with the same enthusiasm he will await a spontaneous birth A man who does cesareans and who will do no other obstetrical work surely must operate on lax indications It goes back to what Deaver once wrote I did a cesarean section because I knew the technique of abdominal operations and did not know how to do an obstetrical delivery

DR W GEORGE LEE This paper merits the commendation it has received from the previous speakers The addition of the indications causing the more severe operations such as the particular reasons for cesarean section and the clinical symptoms that led to high forceps and version is one more thing that would have been interesting and informative

DR CARL HENRY DAVIS (closing) It would be impossible to discuss all the points suggested by Dr Lee in an ordinary paper We had no trouble from hemorrhage The uterus was packed in only 2

patients in this series, and they had premature separation of the placenta before admission to the hospital. A few patients were given ergotole by mouth none was given by hypodermic. We have depended almost entirely on pituitary extract to keep the uterus contracted and prevent bleeding.

Dr Rudolph asked regarding weight. In my paper on weight in pregnancy I reported a case of excessive gain accompanied by a break in metabolism and acute toxæmia early in the ninth month. The basal metabolism was -70 per cent. She was one of the two patients who had a vaginal hysterotomy. A gain approaching a pound per day in the latter weeks of pregnancy means retained fluids and should be considered a sign of beginning toxæmia. Dr Rudolph's case was evidently one of endocrine disturbance. I would be interested to know her basal metabolic rate.

Dr Horner has raised a very important question and one which I cannot answer. In the present paper I have limited the record of morbidity to that shown by the hospital chart since that can be checked by any one. It is difficult to keep records in such a way that one can accurately determine which

of the minor pelvic findings antedated a given pregnancy, and which resulted from it. My records show that I had delivered 96 of the last 277 patients who had the cervix cauterized for chronic endocervicitis. One patient had a trachelorrhaphy and two had low amputations of the cervix as part of an operation for retroflexion which antedated the pregnancy. A check of 100 patients delivered in 1922 showed that 15 per cent had a retrodisplacement when examined in early pregnancy and 16 per cent had a similar condition when examined during the puerperium. The perineum is saved by primary epiotomy and immediate repair. The results have been very satisfactory.

Dr Scott asked regarding the test of labor. Eleven patients had a labor of ten or more hours without engagement of the head. One patient whose labor was induced by a Voorhees bag had a 4 hour test after the bag was expelled.

This series includes all patients delivered by me during the last 2 months of pregnancy from the time I located in Milwaukee to December 1923. While the results obtained were fair I am hoping to do better in the next 500 deliveries.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

AN ATLAS OF HUMAN ANATOMY FOR STUDENTS AND PHYSICIANS. By Carl Toldt M.D. assisted by Prof. Alois Dalla Rosa M.D. Adapted to English and American and International Terminology by M. Eden Paul M.D. (Brux.) M.R.C.S. L.R.C.P. New York The Macmillan Company 1926. First Section and Fourth Section.

AMERICAN MEDICAL AND SANITARY RELIEF IN THE RUSSIAN FAHNE 1921-1923. By Henry Beeuwkes, M.D. New York American Relief Administration 1926.

LA PRATIQUE CHIRURGICALE ILLUSTRÉE. vol. VI. Paris. Gaston Doin et Cie. Editors 1926.

TRAITE DES MALADIES DE LA PROSTATE. By Georges Luys. Prostatectomies et Tumeurs Malignes. By Victor Pauchet. Paris. Gaston Doin et Cie 1926.

LE TRAITEMENT DE L'ULCERE DUODÉNAL. By Le Dr Pierre Pauchet. Paris. Gaston Doin et Cie 1926.

BIOLOGIE UND PATHOLOGIE DES WEIBES EIN HANDBUCH DER FRAUENHEILKUNDE UND GEBURTHSHILFE. By Josef Halban and Ludwig Seitz. Lieferungen 25 and 26. Berlin Urban & Schwarzenberg, 1926.

DIE HYGIENE DER MENSCHLICHEN FORTPFLANZUNG VERSUCH EINER PRAKTIKEN EINGENT. By Alfred Grotzahn. Berlin Urban & Schwarzenberg 1926.

ÉTUDES SUR LE TUBE DUODÉNAL I. ÉPREUVE DE MELITZER-LYON L'ALIMENTATION DUODÉNALE. By Dr René Damade Paris. Gaston Doin 1926.

MESENTERIC VASCULAR OCCLUSIONS SUPPLEMENTED BY AN APPENDIX OF 16 ORIGINAL CASES. By A. J. Colkins M.B. (Lond.) F.R.C.S. (Eng.) New York William Wood and Company 1926.

SURGERY OF CHILDHOOD. By John Frazer M.C. M.D. Ch.M. F.R.C.S. vols. 1 and 2. New York William Wood and Company 1926.

INJURIES OF THE WRIST. A RADIOLOGICAL STUDY BY THE LATE DR. ÉTIENNE DESTOT. TRANSLATED BY F. R. B. ATKINSON. M.D. C.M. New York Paul B. Hoeber 1926.

LOCAL ANESTHESIA IN OTOLARYNGOLOGY AND RHINOLOGY. By James Joseph King A.B. M.D. with SUPPLEMENT ON THE TOXIC EFFECTS OF LOCAL ANESTHETICS. edited by Emil Mayer M.D. Preface by Robert A. Hatcher, M.D. New York Paul B. Hoeber 1926.

CAVERNOUS SINUS THROMBOPHLEBITIS AND ALLIED SEPTIC AND TRAUMATIC LESIONS OF THE BASAL VENOUS SINUSES. A CLINICAL STUDY OF BLOOD STREAM INFECTION. By Wells P. Eggleston M.D. New York The Macmillan Company 1926.

LECTURES CLINICS AND DISCUSSIONS ON ELECTRO-PHYSIOTHERAPY. Held at the Drake Hotel Chicago Illinois October 1 to 16 1925. Under the Auspices of H. G. Fischer & Company Inc. 1926 Chicago.

METHODS AND PROBLEMS OF MEDICAL EDUCATION. 4th ed. The Rockefeller Foundation New York 1926.

POLITZER'S TEXT BOOK OF THE DISEASES OF THE EAR FOR STUDENTS AND PRACTITIONERS. 6th ed. By Milton J. Ballin M.D. Ph.D. Philadelphia Lea & Febiger 1926.

TECHNIQUE DES PRÉLÈVEMENTS ET DES BIOPSIES DANS LA PRATIQUE CLINIQUE. By Robert Dupont Roger Leroux and Jean Dalsace Paris. Masson et Cie 1926.

ERGEBNISSE DER MEDIZINISCHEN STRAHLENFORSCHUNG (ROENTGENDIAGNOSTIK ROENTGEN RADIUM UND LICHT THERAPIE). By H. Holfelder H. Holfeldsen O. Juengling and H. Martius. Band II. Leipzig Georg Thieme 1926.

LEHRBUCH DER TOPOGRAPHISCHEN ANATOMIE MIT BESONDERER BEACHTSICHTIGUNG IHRER ANWENDUNG. By John Blumberg. Berlin Urban & Schwarzenberg 1926.

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

BY ALFRED BROWN M D F A C S OMAHA NEBRASKA

SORANUS OF EPHESUS THE INTRODUCTION TO THE ART OF HEALING

THE golden age of Grecian medicine and surgery lies in the few centuries between Hippocrates in the fifth century B C and the second century of the Christian era when Galen flourished. During this period it was the common thing for physicians to write commentaries on the works of Hippocrates. Through the efforts of Aristotle the Alexandrian Library and the Alexandrian School had been founded and human dissection had been permitted by Alexander of Macedonia and his successors the Ptolemies. Grecian medicine had absorbed this and so improved.

Preceding Galen by about twenty years Soranus of Ephesus came upon the scene. He was born at Ephesus from which he took his name to distinguish him from several others of the same given name Soranus. He studied probably at Alexandria which was then the Mecca of all who wished to study science. Later he went to Rome where he practiced during the reigns of Trajan (A D 98-117) and Hadrian (A D 117-138). At one time he also lived in Aquitania where he treated with some success leprosy which was there prevalent. For the most part however he devoted himself to obstetrics and gynecology and the greatest amount of his writing is on those subjects. He was a member of the so-called Methodist School. Many of his works remained unknown for centuries and it was not until 1838 that F R Dietz discovered his work entitled Concerning the Diseases of Women. Another work 'Concerning the Symptoms of Fractures' is contained in the collection of Niketas, edited by Ant Cocchi Florence 1754. In the Aldine Collection of Ancient Medicine Venice 1547¹ there is tucked away in the center of the book a short tract of eleven pages which purports to be by Soranus and bears the title 'The Most Profitable Introduction to the Art of Healing of Soranus of Ephesus Famous Peripatetic and Ancient Chief Physician'. This is of course a translation as Soranus wrote in Greek. Nothing is stated as to who made the translation so it seems fair to assume it was by one of the Aldine editors and probably is fairly accurate. In it Soranus first takes up a few of the doctrines of the humors of the body in relation to seasons of the year, discusses pain in the chest, disturbances of the stomach, diseases of the bladder, and the symptoms

of stone and several other conditions. Finally he discusses briefly obstetrics. The first paragraph is entitled concerning conception and coagulation of the seed. In the latter part of this he gives his idea of the number seven as being the most important factor in human life. He then goes on to discuss the development of the embryo. One of the most interesting parts of the tract is the preface which deals with the study of medicine. He says:

Who were the first founders of medicine? Apollo indeed invented medicine. Asclepius amplified it. Hippocrates perfected it. It is necessary that I accept him as the leader of men and the judge of all cases and questions as the parent and inventor of all good works through whom logic according to reason has descended to us just as doctrine has been made visible to us so that through it those who are introduced to medicine by the Greeks called *επαγωγικόν* may become better and more authoritative. And therefore to those beginning to learn the art of medicine let me explain the best manner of teaching and the right age to begin and then let me speak about study and its forms then of art and finally of the art of medicine especially. You will learn in four kinds of aphorisms intellectual connective divisible and definitive. That one is called intellectual which with intellect that is with contemplation follows up and considers the afflictions of both men and women connective which surrounds everything that is draws everything together and leaves nothing untouched divisible which divides the human body into parts and declares the affliction of each one particularly definitive which defines the whole and lets it be determined correctly. We will use the definitive more in this work (provided we are not banished by others) because this is the best way of beginning. And the whole briefly defines the remainder and determines it correctly it leaves nothing from which it could as it were retract. However lest the mind of the reader advance cautiously and judge the remainder of the work let it not be concealed of what type is the writing which the preface precedes which indeed should have a brief introduction. It is indeed double partly concerning him who receives the art partly about the art itself. Let me imitating Plato join together the things which follow for Plato says concerning all who are beginning in a profession that he can learn who has skill in those things concerning which he asks

¹Courtesy of Dr Leroy Crumm of Omaha Nebraska

SORANI EPHESII INSIGNIS PERIPATETICI, ET VETVSTISSIMI AR-

CHIATRI IN ARTEM MEDENDI

ISAGOGESALVERRIMA

Tyro medicæ artis qualis esse oporteat Caput 1



STVTIA ueterum in opusculis librorum diuersa posuit principia Nos tamen priocipium sumimus ab eo qui imbui arti medicæ inchoat Sit autem etate quidem illa, ex qua maxime et parus homines transeunt ad magnitudinem quod est in annos undecim Hæc enim etas est apta ad sumendam sanctam artem medicæ corporis autem magnitudinem talem habeat ut neque pinguis sit neque brevis admodum & ut iuuenitatem liberaliter agat & senectutem utilem atque sicilem ducat natura & animo sit studiosus, & ingeniosus quidem & acutus ut citius intelligat & doctibilis sit foris autem ut possit per diem labores sustinere quoniam undique horrenda & itaqum inuisa & alienos casus suos facit esse tristitia Displinarum autem & uirtutum cæterarum minime sit expertus sed & circa mores habeat diligentiam iuxta eam Erasistratum, felicissimum quidem est ubi utraq; res conueniunt, ubi & in arte sit perfectus & moribus sit optimus Si autem unum de duobus deficiat melius etiam uidetur esse bonum quam artificem perfectum, mores habentem malos & improbum esse modeste siquidem mores quod in arte deest, honestate reposita uidentur Culpa autem morum, artem perfectam corrumpere atque improbare potest Necnon & naturæ rerum scientiam habeat ut omnino huius res non expertus esse uideatur His igitur omnibus ornatu esse debet, qui medicæ tam arduam artem aspiciaturus est

De ceterorum medicæ Cap 11

CVRARE etiam debet, qui artem medicam & naturæ scientiam uult inchoare, ne ab errore quenquam alius uis ledat effectus Ea itaque ratione per sacramentum iuramenti sumat doctrinam Græcorum Rhetoricam, Arithmeticam Astrorum quoque ratio sumenda est ut cognoscat eorum artus, & occasus & motus, & tempora anni quæ cum ipsis & nostra corpora permittantur, & eorum mobilitate & perturbatione agtutudines in hominibus commouentur

Qualis esse debeat medicus Cap 111

PERSPICIAMVS autem qualem oporteat esse medicum Sit ergo moribus ornatus & modestus cum decenti ac debita honestate nec desit ei castitas, nec sit superbus sed pauperes & diuites seruos & liberos pariter curet Vna enim apud omnes est medicina Mercede autem siquidem datur, accipiantur & non recitentur si autem non dentur non exigantur quæ quantum quisque dederit, non potest ulla exequare mercede beneficia medicinæ Domos autem quas ingreditur, ita ingreditur, ut ante oculos habeat eorum tantummodo laborantes Memor etiam sit iuramenti Hippocratis ut ab omni culpa se abstineat, maxime à uenereo & corruptibili actu Ea quæ in domibus aguntur & dicuntur, tanquam mysteria celanda exultimet Sic enim sibi & arti ampliore laudem acquirat Habeat etiam digitorum elegantiam & subtilitatem ut laxus omnibus uidetur & in tangendo subtilior appareat hæc enim & ipse Hippocrates docet Nihilominus autem sit & in fabulis munda, & non sit expertus phlosophæ Sit etiam modestus moribus, ut utraq; res conueniant simul sibi, cum artis perfectione, quantum possibile est, & bonitas morum

Quid oporteat medicum periculum aut impetium prelo Cap 1111

FACIAMVS autem utrum à quodam exemplo Communiter eorum tendunt & iustitatur homines cum aliqua necessitas impulerit, & qui didicerunt, & qui non studuerunt sed statim ipsis moribus comprobantur hi qui didicerunt, maxime si facere non recitant Simili modo medicum quam plurimum tractat Denique aut faciem ptisanæ, aut melitraton, & qui non sunt medici, dare possunt quoniam ipsa natura interdum indolis etiam pectorum tribuit efficaciam Sed ipsa operatio, & ipsius res honesta tractatio longe in eo appareat qui peritus est, & sicile improbat imperitum Hippocrates quoque ait Medici quidem summi multi, sed opere ualde pauci Non esse autem opus ipsum tractabitur tribus modis, ut præsentem scilicet eorum causas qui omnino à uitis oppressi sunt, & nullo modo curari possunt, minime suscipiamus Aut eos suscipiamus in quibus ualida natura non minus est præcipitata humoribus aut ea quæ scimus, eo ordine sciamus, ut ad solam utilitatem, totam operis efficaciam dirigamus

REVIEWS OF NEW BOOKS IN SURGERY

BREVITY is the soul of wit and likewise the goal of medical historians who would cajole medical students into swallowing the tonic with the hope of stimulating their appetites for more. A masterpiece of such kind is the *Peaks of Medical History* by Doctor Charles L. Dana of Cornell University,¹ who has confined his range to six peaks and ninety three pages. Doctor Dana presents an interesting chart which outlines his plan and divides his book into six periods or chapters. Beginning with Hippocrates, he fairly leaps from peak to peak, balancing himself among the philosophic pitfalls of the Alexandrian School, still ascending with Galen, tottering through the fog of the Renaissance into the clearing heights reached by Harvey and then, by Jenner.

Throughout the course, Doctor Dana points the way with signposts marking the main advances of each period, which are sufficiently well driven to support a medical student's claim of culture and to hold the serious historian's admiration and respect. For the author has not only developed the route historically and biographically but has paused long enough to point out the social conditions and activities among which the physicians worked and lived. Here is an example of the terse nervous style and intimate erudition of the author. In ten lines he gives the life of Vesalius. Vesalius Galen's pupil for a time was the master spirit of the science and made himself the greatest anatomist of the age. He was born an anatomist. In his boyhood he dissected animals, in his youth he pillaged the scaffold to obtain a skeleton, in his student life he sought the cemeteries at the peril of his life, and finally at the age of twenty three he had made himself a reputation and was appointed professor of anatomy at Padua. He dared to deny the authority of Galen and boldly exposed his errors. In 1543, at the age of 29, Vesalius published his great work the 'Fabrica', which brought anatomy forward with an immense stride.

With such handy volumes at his disposal as this book, that of Park, Buck, Meyer, Steiner and Sudhoff, and the interesting little chronological treatise by Power and Thompson the medical student and interested practitioner have lost every vestige of an alibi to prove the difficulty of getting started in medical history.

M. G. SEELIG

PAUCHET and **Tiery**² have written an orderly and, for the most part, impartial monograph dealing with the technique, indications and dangers of the operation of gastro enterostomy. They

consider the foremost indication for gastro enterostomy to be a duodenal stenosis caused by a cicatrizing and healing duodenal ulcer in the absence of hyperchlorhydria. In cases of acute perforation of duodenal ulcers, if the duodenum is patent the ulcer is sutured and gastro enterostomy is *not* performed. That operation is, however, resorted to when there is duodenal occlusion.

For gastric ulcers the writers recommend resections of the stomach. They believe that the gastro enterostomy in these cases does not prevent bleeding or pain and moreover does not remove the possibility of malignant transformation.

Local anesthesia is the anesthesia of choice. The writers employ linen sutures in cancer cases, but in ulcer cases No. 0 or 00 slowly absorbable catgut sutures.

The authors believe that 5 per cent gastro enterostomies done for gastric or duodenal ulcer are followed by peptic jejunal ulcers. The technique of de gastro enterostomization is described.

The book is profusely illustrated and the steps of a great variety of operations are accurately shown. Chapters on the physiology and on the complications of gastro enterostomy are full of interest. The final chapter is a carefully advised choice of procedures in the various pathological situations involving the stomach and duodenum.

FREDERICK CHRISTOPHER

THE eighth and concluding volume of Aht's system of pediatrics,³ like the preceding seven volumes cannot but confirm the belief that this great work has filled a needed gap in medical literature in general and in the literature of the specialty of pediatrics in particular. Volume VIII is divided into eight parts as follows: (1) Diseases of the Skin, in seven chapters, is edited by Oliver S. Ormsley, M.D., each chapter being written by a different author, (2) Ear Diseases in Childhood is by George E. Shambaugh, M.D., (3) Ocular Diseases of Infancy, by Casey A. Wood, M.D., (4) Hospitals for Infants and Children by John M. Dodson, M.D., (5) Medico Legal Problems by James P. Simonds, M.D., (6) Tumors of Infancy and Childhood, by Oscar T. Shultz, M.D., (7) Encephalitis, by Leslie B. Hyman, M.D., and (8) Animal Parasites, by Henry Baldwin Ward, Ph.D., Sc.D.

In this volume, as in those preceding, one is struck by the almost complete exclusion of any material not directly related to the condition described as it appears in childhood. Anyone in general practice or in any specialty in medicine can consult this system with benefit. To the student in the undergraduate departments of the medical schools it should prove a most valuable reference not only for the actual

¹THE PEAKS OF MEDICAL HISTORY: AN OUTLINE OF THE EVOLUTION OF MEDICINE FOR THE USE OF MEDICAL STUDENTS AND PRACTITIONERS. By Chas. L. Dana, A.M., M.D., LL.D. New York: Paul B. Hoeber, 1926.

²LA GASTRO ENTEROSTOMIE. By Victor Pauchet and Auguste Tiery. Paris: Gaston Doin & Cie, 1926.

³PEDIATRICS. By various authors. Vol. VIII. Edited by Isaac A. Aht, M.D. Philadelphia: W. B. Saunders Company, 1926.

text but for the voluminous bibliography at the end of each chapter. These bibliographies will aid in special studies and in the preparation of papers.

The chapter on medicolegal problems written by a pathologist familiar with the practical as well as the scientific aspect of the subject is a distinctly new feature of such a work. The chapter on hospitals for infants and children should be of material assistance to those planning children's hospitals and children's wards.

The book is complete in every detail from the history of pediatrics in Chapter I to the chapter on hospitalization of the child which one feels should have ended the work. The articles are concise and clear and the size of the work eight volumes is not an indication of befogging verbosity but of completeness.

GERARD KROST

THE Beaumont Lectures¹ of the Wayne County Medical Society of Detroit on the thyroid gland were given by Dr Charles H. Mayo and Dr Henry S. Plummer. They have just been published as a book. Dr Mayo's lecture is a compilation made with the help of Dr W. A. Hendricks of data in regard to the medical history, anatomy, physiology, etiology, chemistry and geographic distribution of goiter. The work of his own colleagues Plummer, Kendall and Rosenow is also described, a quotation from Boothby is given. The short discussion of the parathyroids was evidently written before Collip's extract was demonstrated. The lecture as a whole is a brief uncritical review which unfortunately lacks data or conclusions derived from this great surgeon's own clinic.

In contrast the lecture of Dr Plummer consists entirely of his own speculations and theories. It is a personal and emphatic expression of his position in which there is little weighing of evidence.

PALL STARR

THE sixth edition of Edgar's textbook on obstetrics² has been thoroughly revised by N. W. Vaux. The subject matter is well covered but the arrangement is open to criticism. The pathology of pregnancy and its treatment is discussed before normal labor. For teaching purposes the student should know the normal treatment of pregnancy and labor first. The author seems to appreciate this for on page 312 he states: "The desire of the student to

see and to study abnormal cases should be restrained until he has become thoroughly familiar with the phenomena and natural course of normal labor. In this section for instance he speaks of contractility, retractility and dilatability of the uterus and as yet the student does not know what is meant."

In several instances the reviewer would disagree with the author. Another classification for placenta previa is introduced which does not tend to clear the subject for the student. Manual dilatation of the cervix in placenta previa is dangerous in the hands of the average practitioner. The author shows a rupture of the uterus on page 410 due to this procedure. The use of the curette in abortifacients should be condemned. In the chapter on inverted uterus the Spinelli operation which is probably the most successful is not even mentioned.

The chapters on normal pregnancy, puerperal care and the puerperium are well written. The work is better fitted for the graduate than the undergraduate student.

EDWARD L. CORNELL, M.D.

A VOLUME of 314 pages dedicated to Dr Edward Jackson on his seventieth birthday³ in recognition and appreciation of his distinguished career of leadership in American Ophthalmology contains forty articles of a high average standard of worth covering a fairly wide range of ophthalmic topics and problems contributed by fifty of Dr Jackson's colleagues and pupils.

Of these forty contributions four represent experimental clinical investigation, two experimental laboratory investigation, five are on general clinical subjects without reference to case reports or definite case series, seven on surgical subjects, four of which are concerned with the surgery of cataract, two of the latter being with the use of a suture, the remaining twenty-two being clinical essays embodying a report and discussion of a case of interesting or unusual type or a study of a definite series of cases.

Some of the contributions of especial interest and value are: Improvements in Histological Technique by Verhoeff; Norms of Convergence by Duane; Studies in Ocular Fatigue by Berens and co-workers; Management of Incipient Cataract by Peter and 'Goniocopy in Glaucoma' by Troncoso.

A bibliography of the works of Dr Jackson is appended.

W. F. MONTREIFF

THE THYROID GLAND. By Charles H. Mayo and Henry S. Plummer. Beaumont Lectures. Annual Lecture Course, 1913. St. Louis: Th. C. V. Mosley Co. 926.

EDGAR'S PRACTICE OF OBSTETRICS FOR STUDENTS AND PRACTITIONERS OF MEDICINE. By J. Clifton Edgar. Revised by Norris W. Vaux. 6th ed. Philadelphia: P. B. Kimbrell & Son & Co. 1916.

CONTRIBUTIONS TO OPHTHALMIC SCIENCE. Dedicated to Edward Jackson on his 70th birthday. By his pupils and colleagues. 4th United States Medical Association in George Banting Publishing Company 1916.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

RUDOLPH MATAS *New Orleans President*

WALTER W CHIPMAN, Montreal *President Elect*

FRANKLIN H MARTIN *Chicago Director General*

MONTREAL COMMITTEE ON ARRANGEMENTS

ALFRED T BAZIN, *Chairman*

EDWARD B CHANDLER *Secretary*

WALTER W CHIPMAN

A MACKENZIE FORBES

ALBERT LASSALLE

EUGENE SAINT JACQUES

EDMOND M EBERTS

FRASER B GURD

DAVID W MACKENZIE

WILLIAM G TURNER

ALFRED FERRON

STEPHEN LANGEVIN

OSCAR F MERCIER

COMPLETE PLANS FOR THE CLINICAL CONGRESS IN MONTREAL

At 9 30 o'clock on Monday morning, October 25th, in Windsor Hall at the Windsor Hotel in Montreal, the sixteenth annual Clinical Congress of the American College of Surgeons convenes, the first session being the annual hospital conference at which the problems related to the College's work in the standardization of hospitals will be presented and discussed, as outlined in the program appearing in the following pages

At the Presidential meeting on Monday evening in Windsor Hall, the President Elect, Dr Walter W Chipman of Montreal, will be inaugurated, succeeding Dr Rudolph Matas of New Orleans in that office. The John B Murphy oration in surgery will be delivered at that session by Professor Archibald Young of the University of Glasgow, Scotland

Clinics and demonstrations at the hospitals and medical schools will provide an interesting clinical program for the mornings and afternoons of the four days, Tuesday to Friday, inclusive. For the evening sessions the Executive Committee of the Congress has provided programs of unusual interest

Two series of demonstrations or "dry clinics" form an important feature of the clinical program. One series, which will be of particular interest to the general surgeons, gynecologists, obstetricians, orthopedic and genito urinary surgeons, will be held in Windsor Hall on Tuesday, Thursday, and Friday afternoons and at the University of Montreal on Wednesday afternoon. The second series of demonstrations is of special inter-

est to those engaged in the practice of surgery of the eye, ear, nose, and throat, which sessions are to be held in Windsor Hall on Wednesday, Thursday, and Friday mornings, supplementing the clinical work in those branches to be given in the hospitals each afternoon

General headquarters for the Congress will be established at Windsor Hotel on Dominion Square, where the Windsor Hall, Prince of Wales Salon, Rose, Blue and Oak rooms, and other large rooms and foyers located on the ground floor have been reserved for the exclusive use of the Congress. These rooms provide ample space for the evening meetings, business sessions, hospital conferences, registration and ticket bureaus, bulletin rooms, etc. Headquarters will be open for registration at eight o'clock on Monday, October 25th

The preliminary clinical program, published in the following pages, as arranged by the Committee on Arrangements, of which Dr Alfred T Bazin is Chairman, has been largely revised in recent weeks and is to be still further revised and amplified previous to the Congress, so that the final program of clinics and demonstrations will adequately represent the clinical activities of Canada's great medical center. The actual program of the Congress is to be issued daily during the session, giving in complete detail a description of the clinics and demonstrations at the several hospitals and medical schools. This program will be issued in the form of bulletins posted each afternoon at headquarters for the following day's clinics. A printed program will be issued each morning. The clinical program for Tuesday will

be posted during Monday afternoon and reservations for tickets for Tuesday's clinics may be filed late that afternoon.

The annual meeting of the Fellows of the College will be held in Windsor Hall on Thursday afternoon at 2:30 o'clock to be followed by the annual meeting of the Board of Governors.

HOSPITAL CONFERENCE

The annual hospital standardization conference will begin at 9:30 Monday morning in Windsor Hall at the Windsor Hotel. The preliminary program therefor will be found in the following pages. The recently formed Montreal Hospital Council of which Dr. A. K. Haywood Superintendent of the Montreal General Hospital is chairman is putting forth every effort to make this conference a great success. Montreal with its extensive and modern hospital facilities is a most suitable place for such a meeting. Trustees, superintendents, physicians, nurses, hospital personnel and others will be more than repaid through the practical benefits to be derived therefrom.

A four day program will be presented consisting of interesting and practical symposia and hospital demonstrations. The symposium on nursing arranged for Monday afternoon at 1 o'clock in Windsor Hall will be a joint conference of physicians, nurses and hospital people. Discussion will cover the several viewpoints of the medical profession, the hospital group and the nurses themselves. Noted leaders in the nursing profession of the United States and Canada will be present. It is hoped that such a conference will be of constructive value in promoting better team work among the three groups primarily interested in the best care of the patient. This is probably the first time an opportunity on so large a scale has been afforded for such a purpose. It is believed the discussion will bring forth a solution of the many questions related to nursing standards, nursing education and the present trend of nursing service.

On Tuesday the morning session will be devoted to a most interesting round table conference at which a number of practical problems will be presented and discussed. The afternoon session will be given over to a second symposium dealing with the care of the industrially injured or ill coming under the provisions of workmen's compensation laws. This will be discussed by many leaders in the medical and hospital professions as indicated in the program which follows.

Attention is particularly directed to the symposium dealing with the standardization of

ophthalmological and otolaryngological departments in general hospitals to be held on Wednesday morning. The interest aroused last year in this respect assures most constructive discussions in the way of improving these departments in general hospitals.

A particularly attractive feature of the conference this year will be the program to be carried out on Wednesday and Thursday, when a series of practical studies and demonstrations will be carried out in several of the Montreal hospitals. The development in Montreal hospitals during the past few years has been remarkable, and today a person may readily observe all phases of hospital planning, construction or organization and management in a model way. These practical demonstrations will be of great value to all who can be present on this occasion.

SPECIAL TRAIN FROM CHICAGO

For the convenience of Fellows residing in the central and western states who will attend the meeting in Montreal, the Michigan Central and Canadian Pacific railways will undertake to provide a special train leaving Chicago at 10:05 a.m. on Sunday, October 24th, arriving in Montreal at 8:15 a.m. on Monday. The equipment of this special train will equal that used for the fastest trains between Chicago and New York and will include club compartment, observation standard Pullman sleeping and dining cars. The arrangement is contingent upon reservations for such special train being made by the minimum number required by the Interstate Commerce Commission rules. No extra fare will be charged. Fellows are urged to make their reservations for this special train at the earliest possible date.

REDUCED RAILWAY FARES

The railways of the United States and Canada have authorized reduced fares on account of the Montreal session of the Clinical Congress so that the total fare for the round trip will be one and one half the ordinary first class one way fare. To take advantage of the reduced rates it is necessary to pay the full one way fare to Montreal, procuring from the ticket agent a convention certificate when purchasing the ticket which certificate is to be deposited at headquarters for the use of the special agent of the railway companies. Upon presentation of valid certificate to the ticket agent in Montreal not later than November 2 a ticket for the return journey by the same route as traveled to Montreal may be purchased at one half the regular one way fare.

In the eastern, central, and southern states and eastern provinces of Canada tickets may be purchased between October 21 and 27, in southwestern and western states between October 19 and 25 and in the far western states and western provinces of Canada between October 15 and 21. The return journey from Montreal must be begun not later than November 2.

The reduction in fares does not apply to Pullman fares, nor to excess fares charged for passage on certain trains. Local railroad ticket agents will supply detailed information with regard to rates, routes, etc. Stop overs on both the going and return journeys may be had within certain limits.

Full fare must be paid from starting point to Montreal, and it is essential that a "convention certificate" be obtained from the agent from whom the ticket is purchased. These certificates are to be signed by the general manager of the Clinical Congress and vised by a special agent of the railroads in Montreal during the meeting. No reduction in railroad fares can be secured except in compliance with the regulations outlined and within the dates specified. It is important to note that the return trip must be made by the same route as that used to Montreal and that the certificate must be presented and return ticket purchased not later than November 2.

MONTREAL HOTELS AND THEIR RATES

The five principal hotels of Montreal as listed below afford accommodations for fully 3,000 persons. The number of single rooms available is limited and it is expected that the visiting surgeons will arrange to use double bedded rooms, sharing accommodations with associates or friends. Since the 1920 session in Montreal, a new hotel has been erected, the Mount Royal, on Peel Street two blocks north of the Windsor Hotel, with upwards of one thousand rooms. All of the hotels listed with the exception of the Place Viger are within short walking distances of headquarters. Rates at the several hotels are as follows:

	Minimum Single Room	Rates Double Room
Windsor with bath	\$4 00	\$7 00
with running water	3 00	5 00
Mount Royal with bath	4 00	7 00
Ritz Carlton with bath	6 00	10 00
Queen's, with bath	4 00	6 00
with running water	2 50	5 00
Place Viger with bath	4 00	8 00
without bath	3 00	5 00

LIMITED ATTENDANCE

Attendance at the Montreal session will be limited to a number that can be comfortably accommodated at the clinics, the limit of attendance being based upon the result of a survey of the amphitheaters, operating rooms, and laboratories in the hospitals and medical schools as to their capacity for accommodating visitors. Under this plan it will be necessary for those who wish to attend to register in advance. When the limit of attendance has been reached through such advance registration, no further applications will be accepted.

Attendance at clinics and demonstrations will be controlled by means of special clinic tickets, which plan has proved an efficient means of providing for the distribution of visiting surgeons among the several clinics and insures against overcrowding, as the number of tickets issued for any clinic is limited to the capacity of the room assigned to that clinic.

REGISTRATION FEE

A registration fee of \$5.00 is required of each surgeon attending the annual Clinical Congress, such fees providing the funds with which to meet the expenses of the meeting. To each surgeon registering in advance a formal receipt for the registration fee is issued, which receipt is to be exchanged for a general admission card upon his registration at headquarters during the meeting. This card, which is nontransferable, must be presented to secure clinic tickets and admission to the evening meetings.

PROGRAM FOR EVENING MEETINGS

IN WINDSOR HALL AT THE WINDSOR HOTEL AT 8.15

Presidential Meeting—Monday October 25

Address of Welcome ALFRED T. BAZIN, M.D., Chairman of Montreal Committee on Arrangements
 Remarks by SIR ARTHUR WILLIAM CURRIE, G.C.M.G., K.C.B., LL.D., Principal of McGill University
 Address of Retiring President RUDOLPH MATAS, M.D., New Orleans
 Introduction of Foreign Guests
 Inaugural Address WALTER W. CHAPMAN, M.D., F.R.C.S. (Edin.), Montreal
 The John B. Murphy Oration in Surgery Sir William MacEwen and the Glasgow School of Surgery
 ARCHIBALD YOUNG, M.B., Ch.B., F.R.C.P.S., Glasgow, Scotland

Tuesday October 26

PROFESSOR ROBERTO ALESSANDRI, Rome Tumors in Bones of Thyroid and Parathyroid Type without Lesion of the Thyroid Gland
 WILLIAM J. MAYO, M.D., Rochester, Minnesota The Cancer Problem
 W. SAMPSON HANDLEY, M.S., F.R.C.S., London Progress in the Treatment of Breast Cancer
 ROBERT B. GREENOUGH, M.D., Boston Summary Report of the Committee on the Treatment of Malignant Diseases with Radium and X-ray

Wednesday October 27

EVARTS A. GRAHAM, M.D., St. Louis Recent Additions to our Knowledge of the Gall Bladder
 Discussion EDWARD ARCHIBALD, M.D., and I. M. EBFERTS, M.D., Montreal
 Skin Grafting and Plastic Surgery
 GORDON B. NEW, M.D., Rochester, Minnesota Plastic Surgery of the Face
 JOHN STAGE DAVIS, M.D., Baltimore Transplantation of Skin
 Plastic Surgery of the Hand
 SUMNER L. KOCH, M.D., and ALLAN B. KANAVEL, M.D., Chicago Dupuytren's Contracture
 ARTHUR STEINDLER, M.D., Iowa City, Iowa Restoration of Function by Orthopedic Operation
 HENRY H. M. LALF, M.D., New York Prevention of Loss of Function in the Hand by the Early Use of Skin Plastics
 STERLING BUNNELL, M.D., San Francisco Restoration of Tendons and Nerves

Thursday October 28

JOHN M. C. FRASER, M.D., F.R.C.S. (Edin.), Edinburgh The Involuntary Nervous System in Relation to Abdominal Disease
 Symposium Sterility in Men and Women
 EDWARD L. KEYES, M.D., New York Sterility in Men
 ROBERT T. FRANK, M.D., New York The Differentiation of Endocrine and Mechanical Causes of Sterility in Women
 JOHN OSBORN POLAK, M.D., Brooklyn Clinical Studies in Sterility in Women

Convocation—Friday, October 29

Conferring of Honorary Fellowships
 Presentation of Candidates for Fellowship
 Presidential Address WALTER W. CHAPMAN, M.D., F.R.C.S. (Edin.), Montreal
 Fellowship Address SIR EWEN J. MACFARLAN, F.R.C.P. (Lond.), F.R.S. (Edin.), Cardiff, Wales

PRELIMINARY CLINICAL PROGRAM—GENERAL SURGERY, GYNECOLOGY, OBSTETRICS, ORTHOPEDICS, UROLOGY

MONTREAL GENERAL HOSPITAL

Tuesday

- H M LITTLE—9 Operations Ectopic gestation pelvic inflammations
 F J TEES—9 Demonstration Injury to elbow with late ulnar nerve lesion (5 cases)
 E M EBERTS—10 Demonstration Unusual types of thyroid disease two cases of acute traumatic tension pneumothorax
 F J TEES and F B GURD—10 Fracture clinic
 A T BAZIN—10 30 Operations Gall bladder disease carcinoma of rectum
 L J RHEA and associates—10 30 Clinical pathological conference
 J G W JOHNSON—11 Cranial injuries
 J A NUTTER—2 Orthopedic clinic, operations for paralytic deformities
 F J TEES and F B GURD— Fracture clinic
 L H McKIM—3 Operative treatment of infections and compound injuries of hand and upper extremity

Wednesday

- F S PATCH and R E POWELL—9 Operation Prostatectomy nephrectomy
 F J TEES—9 Demonstration Fractures of ankle and wrist
 A T BAZIN—10 Demonstration Suppurative joint lesions
 F J TEES and F B GURD—10 Fracture clinic
 E M EBERTS—10 30 Operations Radical cure of inguinal hernia by infolding muscular stitch under local anesthesia excision of caecum for carcinoma
 L J RHEA and associates—10 30 Clinical pathological conference
 C K P HENRY—11 Demonstration End results of splenectomy in pernicious anemia
 J A NUTTER— Orthopedic clinic operations for congenital deformities
 F J TEES and F B GURD—2 Fracture clinic
 W L BARLOW—3 Excision of tongue for carcinoma

Thursday

- H M LITTLE—9 Gynecological operations for repair of birth injuries
 F B GURD—9 Demonstration Fractures of femur and patella
 L H McKIM—10 Demonstration Wound infection in appendicitis
 F J TEES and F B GURD—10 Fracture clinic
 A T BAZIN—10 30 Operations Radical cure of hernia by fascial graft carcinoma of colon
 L J RHEA and associates—10 30 Clinical pathological conference
 J A NUTTER—11 Demonstration Backache sciatica sacro-iliac and lumbosacral lesions and spondylitis thesis

Friday

- F S PATCH and R E POWELL—9 Urological operations
 A T BAZIN—9 Demonstration Bone tumors
 F J TEES and F B GURD—10 Fracture clinic
 E M EBERTS—10 30 Operations Thyroidectomies
 L J RHEA and associates—10 30 Clinical pathological conference

WESTERN DIVISION

- F B GURD and associates—9 daily General surgical and gynecological operative clinics
 F B GURD and associates—2, daily Demonstrations of end results on fractures of the ankle tibia and fibula femur, humerus etc

NOTRE DAME HOSPITAL

Tuesday

- O F MERCIER U GARIEPY and L BLAGDON—9 Fracture clinic Presentation of a personal technique and instrument for temporary metallic osteosynthesis demonstration and report of cases
 T PARIZEAU J A DEMERS and O A GAGNON—9 Surgery of the gall bladder operations and demonstration of specimens
 L DE L HARWOOD A ETHIER R TRUDEAU H AUBRY and L GERIN LAJOIE—9 Gynecological clinic Operations and demonstration of cases
 E A RENE DE COTRET and staff—9 Obstetrical clinic Puerperal infection bedside work demonstrations
 J A PANNETON—9 X ray demonstration routine work with exhibition of special technique and films Iodolion in gall bladder diseases lymphoedem in bronchial and lung diseases
 DR BELLEROSE and staff—0 Routine work of out patient department
 NOE FOURNIER—9 Urological out patient clinic

Wednesday

- L DE L HARWOOD A ETHIER R TRUDEAU H AUBRY and H GERIN LAJOIE—9 Gynecological clinic
 B G BOURGEOIS and O MERCIER JR—9 Urological operations suprapubic cystostomy and prostatectomy anesthesia in urology
 E A RENE DE COTRET and staff—9 Obstetrical clinic
 O F MERCIER U GARIEPY and L BLAGDON—9 Fracture clinic demonstration of apparatus on different cases
 J A PANNETON—X ray demonstration routine work with exhibition of special technique and films Iodolion in gall bladder diseases lymphoedem in bronchial and lung diseases
 DR BELLEROSE and staff—9 Surgical out patient clinic
 NOE FOURNIER—9 Urological out patient clinic

Thursday

- L PARIZEAU C A GAGNON, and J A DEMERS—9 Surgical operations Gastro-enterostomy appendectomy
 L DE L HARWOOD A ETHIER R TRUDEAU H AUBRY and L GERIN LAJOIE—9 Gynecological clinic
 B G BOURGEOIS and O MERCIER JR—9 Importance of the catheterization of the ureters in tests of renal function demonstration of cases
 O F MERCIER U GARIEPY and L BLAGDON—9 Abdominal complications in stasis of right hemocolon Operations Sympathectomy blood transfusion
 J N ROY—9 Dry clinic plastic surgery
 J A PANNETON—9 X ray demonstration routine work with exhibition of special technique and films Iodolion in gall bladder diseases, lymphoedem in bronchial and lung diseases
 DR BELLEROSE and staff—9 Surgical out patient clinic
 NOE FOURNIER—9 Urological out patient clinic

ROYAL VICTORIA HOSPITAL

Tuesday

EDWARD W ARCHIBALD and staff—9 General surgical clinic

D W MACKENZIE and staff—9 Urological clinic operations and demonstration of cases

Wednesday

C B KEENE and staff—9 General surgical clinic

W G TURNER and W J PATTERSON—9 Orthopedic clinic operations and demonstration of cases

Thursday

I A C SCRIMGER and staff—9 General surgical clinic

D W MACKENZIE and staff—9 Urological clinic operations and demonstration of cases

Friday

FRANCIS C MCKENTY and staff—9 General surgical clinic

W G TURNER and W J PATTERSON—9 Orthopedic clinic operations and demonstration of cases

ROYAL VICTORIA HOSPITAL—MONTREAL
MATERNITY PAVILION

Tuesday

W W CHIPMAN and H M LITTLE—9 Gynecological and obstetrical clinic operations and demonstration of cases

Wednesday

H C BURGESS and J R FRASER—9 Gynecological and obstetrical clinic operations and demonstration of cases

Thursday

J R GOODALL and J W DUNCAN—9 Gynecological and obstetrical clinic operations and demonstration of cases

Friday

W W CHIPMAN and A G BAIRD—9 Gynecological and obstetrical clinic operations and demonstration of cases

ROYAL VICTORIA HOSPITAL—PATHOLOGICAL
INSTITUTE

Wednesday

E H MASON—9 Pre-operative preparation of the diabetic patient with discussion of so-called diabetic gangrene

J C MEAKINS—9 Medical indications for splenectomy Respiratory abnormalities in regard to the operative risk

D S LEWIS—9 Relation of hypertension to surgical risk

C F MOFFATT—9 Relation of cardiac disease to surgical operative risk

Thursday

DAVID BALLON—9 The bronchoscopic injection of lipiodol as an aid to X ray diagnosis of pulmonary lesions Combined bronchoscopic and X ray demonstration

A H PIRIE—9 Demonstration of lungs injected with lipiodol in bronchiectasis and other diseases Normal abnormalities of bones

F C BROOKS—9 Report on 100 cases in which tetra iodophenolphthalein was given by mouth with operative and other findings

Friday

E W ARCHIBALD I A C SCRIMGER D ROSS GAVIN MILLER JOHN ARMOUR—9 Experimental surgery

HOTEL DIEU HOSPITAL

Tuesday

PIERRE Z RHEAUME and JOSEPH A ST PIERRE—9 Surgical operations Appendectomy for appendicitis chronic and possibly acute cholecystectomy entero-anastomosis hysterectomy, fracture of the femur fracture of the tibia Delbet's walking splint

EUGENE ST JACQUES DONALD A HINGSTON and WILLIAM J DEROME—9 Clinical demonstration Trauma of the hip heliotherapy in the treatment of osseous tuberculosis as practiced at Leysin and Davos, Switzerland pituitary gland clinical pathology limited indications and multiple contra indications of uterine curettage

LEO I TRIZIU—9 X ray demonstration

Wednesday

EUGENE ST JACQUES DONALD A HINGSTON and WILLIAM J DEROME—9 Surgical operations Demonstration of the advantages of the Reverdin needle and self retractors in diminishing the number of assistants hysterectomy for fibroma hysterectomy for salpingo-ovarian thyroidectomy cholecystectomy fracture of the patella Delbet's method

PIERRE Z RHEAUME JOSEPH A ST PIERRE and Professor FRANK BUCHHEIM—9 30 Clinical demonstration Intestinal tuberculosis structure of the oesophagus ovarian conservation uterine fibroma and pregnancy thyroid pathology some clinical aspects of pleomegaly value of the Ambard test in estimating the kidney function

Thursday

EUGENE ST JACQUES DONALD A HINGSTON and WILLIAM J DEROME—9 Surgical operations Appendectomy cholecystectomy gastro-enterostomy hysterectomy thyroidectomy application of starch bandages in trauma of the forearm Delbet's walking splint in fracture of the leg

Friday

PIERRE Z RHEAUME and JOSEPH A ST PIERRE—9 Surgical operations Prostatectomy removal of stone in the bladder intestinal resection nephropexy nephrotomy for stone in kidney hysterectomy appendectomy

MISEPICORDIA HOSPITAL

Tuesday

STEPHEN LANGEVIN—9 White asphyxia and cerebral injuries

H LEBEL—10 Protection of child in breech extraction

L JUTRAS—11 Pernicious anemia and blood transfusion

Wednesday

D MARION—9 Control of eclampsia by intravenous injection of somnifene

D RICARD—10 Syphilis and pregnancy

STEPHEN LANGEVIN—11 Cranial injuries

Thursday

STEPHEN LANGEVIN—9 Hirudo medicinalis (leeches) in femoral thrombophlebitis

P GAUTHIER—10 Pernicious vomiting and blood grouping

D MARION—11 Eclampsia and caesarean section radical treatment

CHILDREN'S MEMORIAL HOSPITAL

Tuesday

- A MACKENZIE FORBES R DEROME K CAMERON and F YORSTON—10 Operations Cleft palate, hernia Demonstrations Application of extension in fractures, application of extension in tuberculous hip

Wednesday

- A MACKENZIE FORBES R DEROME K CAMERON and F YORSTON—10 Operations Tendon transplantation reduction of congenital dislocation of hip Demonstration Scoliosis and its treatment

Thursday

- A MACKENZIE FORBES R DEROME K CAMERON and F YORSTON—10 Operations Harelip sequestro my correction of deformities due to club feet Demonstration Routine examination of children suffering from tuberculous bones and deformities following acute anterior poliomyelitis

Friday

- A MACKENZIE FORBES R DEROME K CAMERON and F YORSTON—10 Operations Tonsillectomies correction of deformities due to rickets Demonstration Preparation of plaster bandages and their proper application

ST JUSTINE HOSPITAL

Tuesday

- A FERROZ Z CREPEAULT and J H RIVARD—9 Operative clinic Harelip undescended testicle scoliosis

Wednesday

- E DUBE A FERROZ and J H RIVARD—9 Operative clinic Congenital dislocation of the hip, congenital hernia, Pott's disease

Thursday

- A FERROZ Z CREPEAULT and E DUBE—9 Operative clinic Cleft palate, prolapse of rectum correction of club feet.

SURGERY OF THE EYE, EAR, NOSE, AND THROAT

CLINICAL DEMONSTRATIONS

in Windsor Hall

Tuesday, 9 30

- WALTER B LANCASTER M D Boston Orbital Conditions Arising from Rhinopharyngeal Disease Discussion opened by CHARLES T PORTER M D Boston and JOHN M WHEELER M D New York
WILLIAM H LUEDDE, M D St Louis Conditions of the Eyeball Arising from Rhinopharyngeal Disease
BURT R STURLEY M D Detroit Chronic Rhinopharyngeal Disease Discussion opened by HERBERT S BIRKETT M D, Montreal

Wednesday, 9 30

- Symposium The Standardization of Ophthalmological and Otolaryngological Departments in General Hospitals (See program of hospital conference)

Thursday, 9 30

- WILLIAM H WILDER M D Chicago Glaucoma After Cataract Extraction Discussion opened by HARRY V WURDEMAN, M D Seattle Wash
WILLIAM T DAVIS M D Washington Unilateral Atrophic Optic Neuritis Discussion opened by S HANFORD MCKEE M D Montreal
GEORGE L TOBEY JR M D Boston Subject to be announced
SAMUEL GLAUER M D Cincinnati Injection of Lipiodol in the Diagnosis of Pulmonary Lesions (Lantern slide demonstration) Discussion opened by DAVID H BALLON M D Montreal

Friday, 9 30

- FELDMAN O LEWIS M D Philadelphia Treatment of Malignant Laryngeal Disease Discussion opened by GABRIEL TUCKER M D Philadelphia
J H CARY M D, Dallas Some Otolological Problems.

- ARTHUR J BEDELL M D Albany The Value of Microscopic Study of the Living Eye (Lantern slides) Discussion opened by JOHN A MACMILLAN, M D Montreal

- WALTER S FRANKLIN M D San Francisco Radium in Extra-ocular Conditions with Report of Cases

ROYAL VICTORIA HOSPITAL

Tuesday

- DAVID H BALLON— Use of lipiodol in pulmonary diagnosis by the bronchoscopic method
WILLIAM J McNALLY— Experimental work on larynx
G EDWARD TREMBLE—2 Nasal prosthesis
Staff—2 Eye clinic slit lamp demonstration

Wednesday

- E HAMILTON WHITE—2 Tonsillectomy with demonstration of intratracheal anaesthesia
J T ROGERS— Immediate skin graft in radical mastoid radical maxillary sinus operation under local anaesthesia
A G McVULEY—2 Cryptic intra-ocular sarcomata, lantern slide demonstration
J A MACMILLAN— Wound infections of the eyeball lantern slide demonstration

Friday

- Prof H S BIRKETT E H WHITE J T ROGERS D H BALLON G E TREMBLE K HUTCHISON WILLIAM J McNALLY—2 Ear nose and throat clinics operations and demonstrations of cases
Staff—2 Eye clinic slit lamp demonstration

MONTREAL GENERAL HOSPITAL

Tuesday

- H D HAMILTON and staff—9 Nose and throat clinic operations and demonstration of cases
G E HODGE and V HENRY—2 30 Bronchoscopic clinic demonstration of cases
C J STEWART—2 30 Tonsillectomy under gas anaesthesia

Wednesday

- G H MATHEWSON and S H McKEE—2 30 Eye clinic
 H BABY—2 30 Zinc ionization in chronic otorrhoea
 technique and demonstration of cases
 A E LUNDON—2 30 Nasal prosthesis (lantern slides)
 J B GALLAGHER—2 30 Brain abscess

Thursday

- H D HAMILTON and staff—9 Nose and throat clinic
 operations and demonstration of cases

Friday

- G H MATHEWSON and S H McKEE—2 30 Eye clinic
 A W FURNES—2 30 Labyrinthine tests as an aid in
 diagnosis of intracranial lesions demonstration of
 cases
 A O FREEDMAN—2 30 Salivary gland tumors

HOTEL DIEU HOSPITAL

Tuesday

- ALBERT LASSALLE—2 30 Dacryocystorhinostomy (Du
 puy Dutemps technique) operation followed by dem
 onstration with lantern slides

- F BADEAUX—2 30 A rare case of conjunctivitis with
 discussion

Wednesday

- J P F BOLSQUET—2 30 A new method of operation on
 the frontal and ethmoidal sinuses operation under
 local anaesthesia
 G BADEAUX—2 30 Twenty cases of thrombophlebitis of
 the jugular vein with discussion

Friday

- ALBERT LASSALLE—2 30 Reconstruction of the lachrymal
 ducts by dermo-epidermic graft demonstration with
 lantern slides
 J P F BOLSQUET—2 30 Ocular muscular imbalance
 demonstration with living cases

NOTRE DAME HOSPITAL

- J N ROY Melanosarcoma of limbus Technique for
 saddle nose
 P PAVETON Technique of hearing test Case of cataract
 extraction (combined) by trauma
 J BRULL Case of lipoma of the bulbar conjunctiva

HOSPITAL STANDARDIZATION CONFERENCE

PRELIMINARY PROGRAM

Windsor Hall—Monday—Morning Session 9 30

Chairman RUDOLPH VITAS M D New Orleans President

Opening Address by the President

The Montreal Hospital Council A K HAYWOOD, M D Superintendent Montreal General Hospital
 Chairman Montreal Hospital Council

Presentation of the Official Report of Hospital Standardization for the Year 1926 FRANKLIN H MARTIN
 M D Chicago Director General American College of Surgeons

The Minimum Standard as a Factor for Better Surgery WILLIAM J MAYO M D, Rochester

The Minimum Standard as Applied to the Department of Internal Medicine Representative of the
 American College of Physicians

Educational Opportunities of Hospital Standardization EDWARD A FITZPATRICK Ph D Milwaukee
 Dean of Graduate School Marquette University

The Trustees Opinion of Hospital Standardization ROBERT WOOD JOHNSON New Brunswick N J Presi
 dent of Board of Trustees Middlesex General Hospital

Impressions of a New Zealander on Hospital Standardization L E BARNETT, M D Dunedin New
 Zealand Eminent Professor of Surgery Otago University Medical School

General discussion

Afternoon Session - 00

Joint Conference on Nursing—Nursing Standards Nursing Education Nursing Service Conducted by
 A K HAYWOOD, M D Superintendent, Montreal General Hospital

Nursing as a Service Profession W W CHURMAN M D Montreal Professor of Gynecology and Obstet
 rics McGill University Faculty of Medicine President El ct American College of Surgeons

What the Medical Profession Expects in the Nursing Care of the Patient A T BAZIN M D Montreal
 Professor of Surgery and Clinical Surgery McGill University Faculty of Medicine

(A) Nursing from the Standpoint of the Medical Profession

The Present Status of Nursing from the Viewpoint of the Medical Profession JOHN E JENNINGS
 M D Brooklyn Surgeon Brooklyn Hospital

Discussion opened by L J AUSTIN M D Kingston Professor of Clinical Surgery Queens Uni
 versity Faculty of Medicine

(B) Nursing from the Standpoint of the Hospital

The Present Status of Nursing Service from the Viewpoint of the Hospital Superintendent JOHN E DOUGHERTY, M D , Brooklyn, Superintendent Jewish Hospital, and JOSEPH J BAKER, Brooklyn President, Board of Directors, Jewish Hospital
 Discussion opened by LOUIS C TRIMBLE New York City, Superintendent New York Post Graduate Medical School and Hospital

(C) Nursing from the Standpoint of the Nursing Profession

A Standardization Program for Schools of Nursing LAURA R LOGAN, R N , Chicago, Dean, Illinois Training School for Nurses
 Discussion opened by GRACE M FAIRLEY, R N , London, Ontario, Superintendent of Nurses, Victoria Hospital

The Relationship of the State Department of Education to Hospitals Through their Registered Schools of Nursing ALICE S GILMAN, R N , Albany, Secretary, State Board of Nurse Examiners, University of the State of New York

Discussion opened by FLORA M SHAW, R N , Montreal, Director of School for Graduate Nurses, McGill University

Hourly or Group Nursing JANET M GEISTER, R N , New York City, Assistant Executive Secretary Associated Out Patient Clinics of the City of New York

Discussion opened by CARRIE M HALL, R N , Boston, President, National League of Nursing Education

General discussion and round table conference*Tuesday—Morning Session, 9 30*

Chairman W W CHAPMAN, M D , Montreal, President

Remarks by the Chairman

Some Things Which Seem to be Lacking in Hospitals REV C B MOULINIER, S J , Milwaukee, President, Catholic Hospital Association

Special Problems and their Solution from a Survey of the Hospital Field NEWTON E DAVIS, Chicago, Corresponding Secretary of the Board of Hospitals, Homes and Deaconess Work of the Methodist Episcopal Church

Round Table Conference—Conducted by O F MERCIER, M D , Montreal, Professor of Clinical Surgery, University of Montreal Faculty of Medicine

The Importance of Strict Operating Room Control Discussion opened by SOUTHGATE LEIGH, M D , Norfolk, Va , Visiting Surgeon and Gynecologist, Sarah Leigh Hospital and Clinic

A Successful Method of Analyzing Hospital Deaths Discussion opened by W FRANK FOWLER, M D , Rochester, N Y , Attending Surgeon, Highland Hospital

An Annual Medical Audit for Hospitals Discussion opened by GEORGE GRAY WARD, M D , New York City, Professor of Obstetrics and Gynecology, Cornell University Medical College

Standardization of Hospital Sundries F H SLAYTON, M D , Pittsburgh, Mellon Institute of the University of Pittsburgh

Open versus Closed Hospitals Discussion opened by JOHN A MCNAMARA, Chicago, Managing Editor, The Modern Hospital

Basic Considerations and Requirements for (a) Extension of Privileges to Doctors to Attend Private Patients in Hospitals, (b) Membership and Appointment to the Attending Staff Discussion opened by ALLAN CRAIG, M D , Chicago Associate Director, American College of Surgeons, Director of State and Provincial Activities

The Proper Conduct of the Staff Conference Discussion opened by P J KEARNS, M D , Montreal Pathological Institute of McGill University

Follow up and End Results Discussion opened by STANLEY T FORTUNE, M D , Cambridge, Resident Surgeon, Mary McClellan Hospital

Afternoon Session, 2.00

Symposium—A Minimum Standard for Hospitals in the Care of the Industrially Injured or Ill Coming Under the Provisions of Workmen's Compensation Laws FRANK D JENNINGS M D Brooklyn Clinical Professor of Surgery, Long Island College Hospital presiding

Workmen's Compensation Laws their Intent and Significance CHARLES DECKELMAN Hartford Discussion by HENRY D SAVER, New York City Former Industrial Commissioner, State of New York, and W D KINGSTON, Toronto Industrial Commissioner, Province of Ontario

Ambulance Service and First Aid FREDERICK J TIES, M D Montreal Lecturer in Clinical Surgery McGill University Faculty of Medicine

Hospital Reception of Injured Workmen G W MCNER M D Valhalla, N Y Superintendent Grasslands Hospital

General and Special Features in Hospitals for Adequate Treatment of Industrial Patients

The Essentials of a Complete Hospital Record of Industrial Patients GEORGE G DAVIS M D Chicago Assistant Clinical Professor of Surgery, Rush Medical College of the University of Chicago

Co-operation between Hospitals and Those Administering Workmen's Compensation Laws FREDERIC A BEELEY M D Waukegan Ill Professor of Surgery Northwestern University Medical School Discussion by M O FOLEY Chicago Managing Editor Hospital Management

The Care of the Ambulatory Patient and Follow up of Discharged Patients S POTTER BARTLEY M D Brooklyn Associate Professor of Surgery Long Island College Hospital Discussion by JOHN E RANSOM Toledo Superintendent Toledo Hospital

Wednesday—Morning Session 9.30

Symposium—The Standardization of Ophthalmological and Oto Laryngological Departments in General Hospitals HERBERT S BIRKETT M D Montreal Professor of Oto Laryngology, McGill University Faculty of Medicine presiding

The Purpose of this Conference M T MACLEACHERN, M D, Chicago Associate Director, American College of Surgeons Director of Hospital Activities

Summary and Conclusions from Last Year's Conference Held in Philadelphia JOSEPH C BRICK M D Chicago Associate Professor of Oto Laryngology University of Illinois College of Medicine

Topics for Discussion Planning by EDWARD F STEVENS of Stevens & Lee architects Boston and Toronto Equipment organization administration and service discussed by EDWARD JACKSON M D Denver FRANK M SULZMAN M D Troy HARRIS P MOSHER M D, Boston THOMAS H HALSTED M D Syracuse and other ophthalmologists and oto laryngologists

Summary and Conclusions CRAWFORD C McCULLOUGH M D Fort William Ontario, Ophthalmologist and Oto laryngologist McKellar General Hospital

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XLIII

NOVEMBER, 1926

NUMBER 5

DIFFUSE GASTRIC POLYPOSIS—ADENOPAPILLOMATOSIS GASTRICA

REPORT OF FIVE PROVEN AND SEVEN PROBABLE CASES

By HAROLD BRUNN M D AND FELIX PEARL M D SAN FRANCISCO CALIFORNIA
From the Surgical Services of the University of California Medical School and Mt. Zion Hospital

THE great predominance of malignant over benign neoplasms of the stomach is in a great measure responsible for the dearth of medical literature on benign tumors and for the comparatively small number of case reports. The term polyp, originated by Galen for pedunculated tumors of the nose, refers not to a structural property but merely to the form which may be assumed by any growth. In this report we are interested in benign epithelial polypoid growths of the gastric mucous membrane, not in the single isolated growths, but in the multiple polyps involving diffusely the gastric mucosa. This condition is known as diffuse gastric polyposis, polyadenoma, adenomatosis gastrica, papillomatosis gastrica, etc. It is unavoidable that confusion should occur in the use of terms like gastric polyposis which signify no definite pathological entity. Brissaud was the first to classify his cases pathologically under the term polyadenoma, but it is noteworthy that later authors attempted with other terms to describe more fully this condition. The term adenopapillomatosis seems to describe more accurately the pathological picture, yet this term is far from being universally used or understood by the medical profession. In spite of the objections to it, the term gastric polyposis is firmly rooted in the minds of clinicians as a broad clinical, if not a patho-

logical entity, and has been sanctioned by long and common usage both in the literature and in medical parlance. Some authors use it indiscriminately to designate all polypoid growths of the stomach, single or multiple, others, like Balfour, claim that it should be used to designate only the most widespread involvement of the mucosa and should not be confused with single polyps or papillomatous masses, while Meyer and others feel that there is no difference in kind between multiple polyps and solitary ones. For purposes of study we have here concerned ourselves with those cases having three or more polyps, and have collected all reports of such cases from the literature from 1820 to 1925, numbering 84 cases, including 5 proven personal cases. To this we have added 7 other cases which are probable but not yet proven.

Polyps of the stomach were known to Morgagni, who knew little of their true nature. Cruveilhier, in 1833, gave the first distinct conception of gastric polyposis. Andral distinguished between gastric polypi and cancerous tumors. Brissaud was the first to classify these polypi pathologically as polyadenoma. The first comprehensive study and classification was made by Menetrier, in 1888, who advanced chronic gastritis as the cause. Hauser, Watanabe, Wechselsmann, Rosenbach, Disque, Meulengracht, Heinz, Anschuetz,



Fig 1 Case of phytobezoar Cellulose material retained in the stomach presenting a picture similar to that produced by polypoid showing irregular coarse mottling throughout with preservation of gastric outline



Fig 2 Case of phytobezoar 3 months after anterior gastrotomy and removal of large amount of cellulose material Stomach now of normal outline

Konjetzy and Chosrojeff are among those who advanced the study. The first ante mortem diagnosis was made by operation in 1909 by Wegele. The first case diagnosed by X ray was reported by Balfour in 1919. In 1922 Schundler reported the first and only case diagnosed by gastroscopy.

INCIDENCE

There is considerable disparity in the incidence statistics of gastric polypoid. This is in part due to the fact that they are often combined with statistics of polypoid of other portions of the gastro intestinal tract. Among the more important ones are those of Epstein¹ who found 14 cases of gastric polyp in 600 autopsies, only 10 of which had 3 or more polyps. Tigner² who found only 14 benign tumors of the stomach in 3,500 autopsies, and more recently of Balfour³ who found only 1 case in over 60,000 abdominal sections at the Mayo Clinic, 8,000 of which were for gastric lesions. Doering⁴ reported 50 cases involving

the whole gastro intestinal tract, the stomach being involved in only 5 cases. Verse⁵ reported 35 cases, the stomach being involved in only 5, but never alone. Of Port's⁶ 14 cases only 1 had stomach participation. In over 50,000 roentgenological examinations of the stomach Carman⁷ encountered only 2 cases. These figures however inadequate show that the condition is extremely rare, yet the general impression prevails that it is much more prevalent than these statistics seem to indicate, and this seems to be verified by cases here reported, all occurring within the last 5 years. Males are more often affected than females. Of 16 cases collected by Mills⁸ 12 were not over the age of 60, 5 were not over 40. Rosenbruch⁹ and Disque¹⁰ in collecting all cases of stomach polyps, single and multiple, note that most cases are between the ages of 60 and 70. Wechselmann¹¹ in his report of polypoid of the whole gastro intestinal tract claims that the percentage increases to the age of 40 and then diminishes. Heinz¹² notes that the young are affected by gastric polypoid more often than the old.

In a disease which is recognized so rarely and in which the patient may be symptomless for so long, one cannot expect the statistics of age incidence given by different writers to correspond closely. The average age in our own collected statistics (Table I) is 54 years, the youngest 20 years, the oldest 8 years.

¹Th. J. Epstein has been quoted as stating that the incidence of gastric polypoid is 1.4 per cent. In these figures probably typographical error.



Fig 3 Case 1 V T Polypsis gastrica Arising from the middle third of the greater curvature of the stomach is a large lobulated irregular mass At the site of attachment the greater curvature is broken up into small thin lines but is not totally absent as in a case of malignancy

The ages in 55 per cent of the cases are between 50 and 70 years The proportion of male to female is as 3 to 2

ETIOLOGY

The question of the etiology of such multiple growths of the stomach mucosa opens up the whole controversy over the origin of polyp in general Among the various theories advanced in explanation of the origin of polyposis, two have received outstanding support

The first claims them to be of congenital origin Wechsellaun thinks that the polyps emanate from epithelial fetal anlagen, separated during development, which are later stimulated to growth by chronic inflammatory irritation Rippert accepts the congenital origin theory but claims that the connective tissue, not the epithelium, is the primary factor separating the epithelial cell complexes and irritating them to abnormal growth That a certain hereditary influence is present among cases of gastro intestinal polyposis is



Fig 4 Case 2 A R A constant large indented area near the middle of the greater curvature The gastric wall is preserved for the most part however

very probable inasmuch as the disease has been found in twins, in three, in four, and in six brothers and sisters, in a mother and son etc Wechsellaun noted outspoken familial predisposition in 50 to 60 per cent of cases in which the whole gastro intestinal tract was involved, Port in 5 out of 14 cases In those cases in which the involvement covers large areas of both stomach and intestine, separated by a considerable extent of normal mucous membrane, the congenital factor is much more likely Statistics which deal with the stomach alone are so few that they are not suitable for reliable deductions In our complete series we have not found one case in which there was an unquestionable positive hereditary factor

The second theory has a larger following, including Cornil, Menetrier, and Verse, who favor the theory of acquired origin, particularly by chronic inflammatory changes The statement of Meulengracht that all cases sufficiently investigated show chronic inflammatory changes is not borne out although a large percentage of the cases show such changes Konjetzny claims to have found all stages from hypertrophic gastritis to adenoma and finally to carcinoma Rosenbach and Disque claim that atrophic gastritis forms the soil for these growths, this theory being in part sup

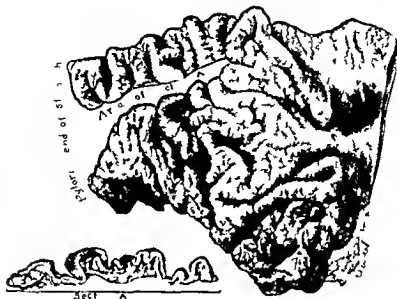


Fig 5 Caecum R Specimen removed at operation showing hypertrophic condition of the mucosa with areas of hæmorrhage and necrosis

ported by the fact that gastric anacidity is almost constantly present

Tsukiasaka found marked epithelial hypertrophy in the stomachs of two monkeys probably produced by irritation from ascaris. There are many other instances of the association of parasites with polyps both in men and animals and it seems probable that in these cases the parasites may have had a definite etiological relation to the tumors especially in view of the mechanical and chemical trauma which we know they produce. Ishibashi and Ohtani by injecting coal tar into the submucosa of healthy rabbit stomachs produced actual papillary adenoma, proliferation was evident by the second week and the tumor was well developed by the fiftieth day. In this connection it is interesting to recall Otto's case of gastric polyp surrounding a piece of wood with no evidence of inflammation.

By far the most significant experimental work in this regard was done by Fibiger. By feeding a certain nematode previously not described he was able to produce experimentally in the stomachs of healthy wild rats, wide spread polypoid growths of the mucosa the initial stages of which were epithelial hyperplasia and inflammation and he was able to

follow the lesions to malignant degeneration with unquestionable metastasis. These tumors often reached a colossal size and some times filled the entire cavity of the stomach. Fibiger thought that the anatomical changes in the rat were caused by toxins produced by the parasite. In the formed state the parasite inhabits the flat epithelium of the stomach and oesophagus of the rat, its necessary intermediate host is the cockroach. The roaches feed upon rat feces containing nematode ova and the larvae travel to the skeletal muscles. Rats eat the roaches and thus are infected anew. The rats may be infected experimentally by feeding them cockroaches bearing these nematode larvae but they cannot be infected by feeding them ova. Wassink working with infected cockroaches obtained from Fibiger, reproduced the tumors in rats and also in mice and from a large series was able to confirm in every detail the statements of Fibiger. In addition he found in native (Holland) rats a parasite very similar if not identical to that described by Fibiger, which caused tumors not so large as those produced by the Fibiger parasite.

Against the theory of chronic irritation as a cause are the statistics of Lange who found



Fig 6 Case 2 A R Low power photomicrograph showing general structure of the hypertrophic gastric mucosa. Note the endothelial spaces toward the periphery. Hematoxylin and eosin stain.

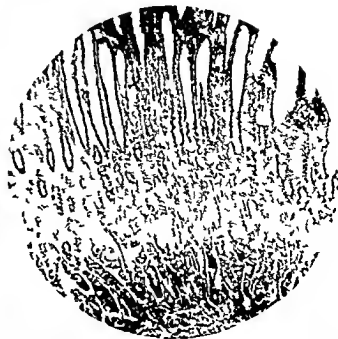


Fig 7 Case 2 A R Low power photomicrograph van Gieson stain showing endothelial spaces which were filled with erythrocytes.

no polyps in 46 cases of chronic gastritis, but only the slightest hyperplastic phenomena, and of Perinn, who, in 50 cases of chronic gastritis in tuberculous subjects, found no evidence of tumor. Weichselmann notes that the appendix, which is the portion of the gastrointestinal tract most frequently involved by inflammation, has never been known to have a polypoid growth of the mucous membrane.

Hauser found small round intracellular bodies resembling the ones found by Pfeiffer and Weimer in variola, but there is no evidence that these bodies are protozoa, and most authors think they are cell degeneration products. Weichselmann admits that chronic irritation can produce epithelial overgrowths, but insists that these are not true polyps, not neoplastic but hyperplastic, while others who are exponents of the theory of chronic inflammation admit that there are some cases which are probably congenital. In our series, chronic inflammatory changes were found in 27 cases (32 per cent).

Hauser claims that the cause is a primary degeneration of the glandular epithelium, not congenital, that inflammatory changes are secondary and not found in the early growths, and that the polypoid form is the result of

mechanical pull by the action of the stomach content on a growth already present.

The other theories of acquired origin such as alcoholism, atheroma of the gastric vessel, syphilis, amyloid degeneration, etc., are not

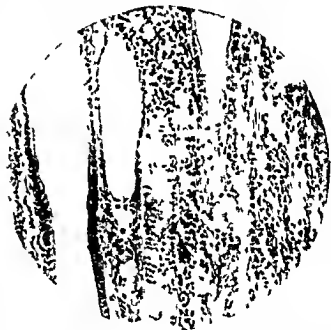


Fig 8 Case 2 A R High power photomicrograph van Gieson stain centered on area noted by x in Figure 7 showing flat endothelium lining the dilated spaces. The spaces were filled with erythrocytes.



Fig. 9. Case 371. Two large rounded defects in greater curvature with irregular mottling but not complete loss of stomach outline.

generally supported and will not be discussed. It is interesting to note however that in our collected statistics there was a positive history of excessive alcohol ingestion in 8 cases (9 per cent). In only 2 cases was there a positive Wassermann and in 1 case there was a history of syphilis but a negative Wassermann.

It is very probable that there are two types of epithelial overgrowth: an hyperplasia secondary to inflammation and an hypertrophy congenital in origin. It is our experience from sections taken from some of our own cases which conformed more to the congenital type that the epithelium assumes the dominant role, the connective tissue being relatively passive and that evidence of chronic inflammatory changes is distinctly secondary.

PATHOLOGY

In contrast to the dispute which rages over etiology there is fairly close agreement among various writers as to the pathological findings. The early classification of Menetrier is still regarded by many as satisfactory. He divides polyposis into two types: one type polyadenoma *polypeau* in which many discrete

usually pedunculated lobulated tumors bearing frequent cysts affect diffusely the gastric mucosa and another polyadenoma *en nappe* in which the hypertrophy forms a raised well demarcated plaque not lobulated cystic nor pedunculated composed of closely placed folds of hypertrophic mucous membrane. The first type is thought to be the result of hypertrophic changes involving the ducts and necks of the glands with well marked participation of connective tissue elements which form the stalk and ground work of the tumor pattern. The second type more rare is thought to be a more purely epithelial growth involving the fundus of the glands. Only 5 cases of this type are on record. Menetrier describes a case in which both varieties were present in the same specimen. Menetrier however claims that all polyps are inflammatory in origin and makes no distinction between his cases and those which are reported by others as congenital in origin.

As has been noted we feel strongly that a distinction must be made between two types of multiple polypoid conditions of the gastric mucosa: a congenital hypertrophy and an hyperplasia acquired through chronic irritation.

It is recognized that the boundary which separates neoplasm from hyperplasia is very uncertain. The most widely accepted criteria of hyperplasia may be satisfied by undoubted adenoma especially in the early stages when both morphological and functional identity often exists. That actual extensive polypoid growths can be produced by chronic irritation can hardly be doubted in the face of the significant experimental work of Fibiger and Wassink already mentioned. In writing of the differences between true neoplasms and hyperplasias in the gastro-intestinal tract Wechselmann states: 'In contrast to the sharp boundaries of the adenomatous tumors the defective margins in these inflammatory hyperplasias merge into the normal tissue. The border of the hyperplastic mucous membrane has a slow rise to a hilly slope and is more flat and spread out on account of the wide extent of the inflammatory irritation. In them the impression of an independent suddenly arising and isolated tumor is lack

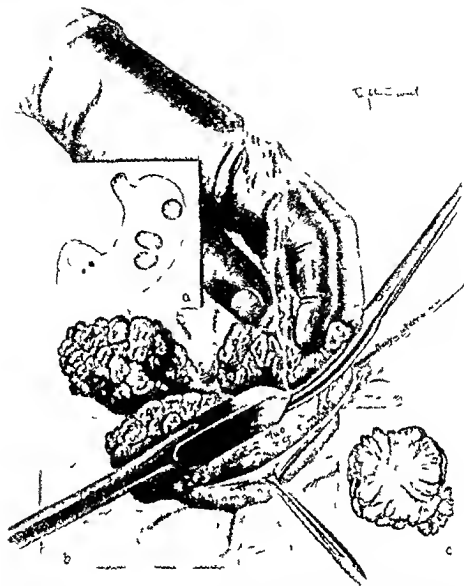


Fig 10 Case 3 E 1 a Number, size and position of tumors b, A large mass clamped at its base is being removed with cautery irons. The strip of healthy mucous membrane separating the polyps can be seen c, Cross section of a characteristic polyp showing the fibrous core and the superimposed hypertrophic epithelium

ing. Their structure is coarse in comparison to the dainty adenomata; their height is insignificant and there is never a differentiation into head and stalk. Their consistency is firm; they rest immovably on the mucous membrane. The folding and swelling of the mucous membrane seen macroscopically is found on microscopic examination to consist of a thickening of the mucosa and a diffuse increase and enlargement of the glands, the structure of which shows no departure from the normal. It is especially noteworthy that in contrast to the other polyps the submucosa

takes no part in the growth as a connective tissue core.

The discrete polyps are usually soft, smooth, and lobulated, and contain small cysts. On pressure they exude a considerable quantity of mucus, and a thick layer of similar mucus often overlays the surface of the gastric mucosa. Some are pedunculated, some broad based, some spherical, some hemispherical, and one finds button-like prominences which represent tumors in the early stages. They are usually lentil to nut size, although wide variations in size are met with from minute



Fig. 11. Case 3. E. I. Low power photomicrograph. The epithelium has broken through the muscularis mucosae. Note the complex character of the gland spaces with numerous side processes.

warty excrescences which become visible only when the stomach is submerged in water to large growths the size of a fetal head. The color varies from gray to reddish brown depending on the vascularity of the tumor. All are covered with a thick layer of mucosa which may display punctate hemorrhages or areas of necrosis and ulceration. They are freely movable on the submucosa. The intervening mucosa in this type is usually not altered but sometimes one sees an increase in the size of folds. Section shows the tumor to consist of a marked thickening of the mucosa with a core of connective tissue from the submucosa.

On microscopic examination of a discrete polyp one finds a fairly orderly arrangement of epithelial cells lining gland spaces in an adenomatous pattern. These are supported by a fairly well marked connective tissue stroma. The epithelium is cylindrical or cuboid, having basal nuclei which contain well defined nucleoli and deep staining cytoplasm showing a variable tendency to produce mucus. The distinction between chief and parietal cell is lost. The cells are single layered and show some evidence of metaplasia. Mitoses are infrequent. The glands are variable

in size ranging from epithelial plugs to large dilated cystic spaces. The lumina are often filled with a homogeneous substance resembling mucus. The stroma is usually well marked and contains an occasional lymphocyte and plasma cell. In the benign condition the hypertrophy is definitely limited by the muscularis mucosae. The submucosa appears normal.

The picture is often modified by secondary changes. The most frequent changes are inflammatory; the most important are malignant. Inflammatory changes are due to trauma, mechanical or chemical or to actual bacterial invasion. In such cases one sees the epithelium damaged, the interglandular tissue, and sometimes also the lumina of the glands filled with exudate consisting of polynuclears and lymphocytes, and the blood vessels hyperemic. Occasional blood extravasations into the interglandular tissues or even into the gland spaces are seen. Cases are reported of the occurrence of true abscesses in gastric polyps. When tumors become detached from their pedicles they are exposed to the digestive action of the gastric enzymes for variable periods and corresponding lytic changes are seen in the superficial layers of the tumors. Wide spread inflammation and digestion were noted in the specimen vomited in our Case 10 in which there was undoubtedly a large element of active acute inflammation as evidenced by the large number of polymorphonuclear leukocytes both in the specimen and in the gastric content.

Malignant degeneration in this condition is evidenced by changes similar to those occurring in malignant epithelial degeneration elsewhere. The epithelium becomes many layered, more undifferentiated, exhibits polymorphism, grows in a disorderly fashion and mitosis becomes frequent. Finally the epithelium bursts its normal barriers and breaks through the muscularis mucosae entering the submucosa. It is only at this stage that we can be sure that the growth has assumed a malignant character. In our Case 3 it was only after diligent search that Dr. Rusk could demonstrate actual invasion (Case 3, Fig. 11). Miller reports a case of solitary polyp of the stomach in which unquestionable metastases



Fig. 1. Case 3 E F. Roentgenogram taken 16 months after operation showing a recurrent polypoid mass in the cardiac end of the stomach, marked contraction of the pyloric antrum and pylorus which is connected with a mass palpable subcutaneously. Probably malignant. Patient's general condition, however, is very good.



Fig. 13. Case 4 R A W. Roentgenogram showing multiple punched out areas throughout gastric shadow with preservation of gastric outline. Typical undercutting is well shown on the area in the lesser curvature, marked with arrow. From the X-ray examination a diagnosis of multiple gastric polyposis was made.

were found, but in which it was impossible to demonstrate deep infiltration in the primary growth.

In the cases which conform more to the acquired type, the description of Wechselmann, quoted above, leaves nothing to be added. In these cases the intervening mucosa and also the submucosa show all the signs of chronic gastritis.

Rosenbach and Disque claim that atrophic gastritis is the primary factor in the formation of polyps, and have described cases in which the phenomena of atrophy and hypertrophy are found side by side. In such cases the hypertrophy is thought to follow the atrophy, and these authors claim to have found all stages from atrophic gastritis to small adenomatata.

In one of our cases the thickening of the mucosa in the form of a plaque resembling polyadenoma *en nappe* was found on closer study to be the result of a telangiectatic formation in the mucous membrane composed of true endothelial spaces filled with blood. An other similar case was reported by Monfalcon (1820), who described an extraordinary polyp,

the structure of which resembled that of the corpus cavernosum. It is very possible that in the past this type of tumor has been confused with the true epithelial formations, especially the *en nappe* variety.

The lower third of the stomach is most frequently involved but the change stops abruptly at the duodenum. Brissaud claims that the polyps are most numerous over the area in which the pepsin forming glands abound. Basch notes that single polyps are most numerous near the pylorus, multiple ones in the middle portion of the stomach. Our own collected statistics show that in 85 per cent of cases in which the situation of the tumor was given the lower third of the stomach was involved and in 35 per cent of the cases the lower third was involved alone. The upper third was involved in only 50 per cent alone in only 6 per cent. The middle third of the stomach was involved in 56 per cent alone in 3 per cent. The greater curvature was involved in 54 per cent. The lesser curvature was the least frequent site, having been involved in only 40 per cent. The entire stomach was involved in 20 cases (28 per

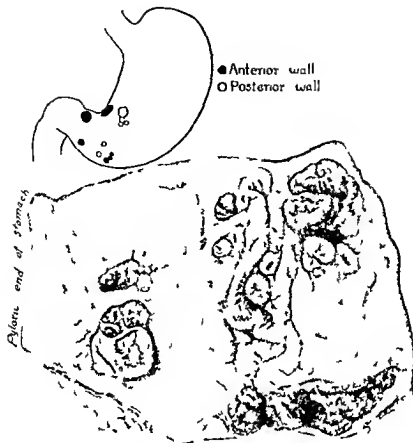


Fig. 14. Case 4 J. A. W. Surgical specimen showing multiple polypi of the mucosa. Diagram indicates position number and relative size of the tumors. One tumor is not shown since it lay above the line of section. This tumor was removed separately and its base thoroughly cauterized.

cent). These statistics show that the lower third and the greater curvature are the sites of predilection for the disease. Coincident involvement of other portions of the gastro intestinal tract was noted in only 6 cases (7 per cent).

The tumors vary widely in number; the report of one case records over 400 discrete growths. They are scattered diffusely or arranged in parallel rows, often in clusters. Sometimes the mucosal surface presents a picture which strongly simulates cerebral convolutions as depicted in Case 2 (Figure 5). It is not unusual to find a single large polyp and in the immediate vicinity of its base several smaller ones, or to find the neighboring mucosa thrown into large numbers of small tufts.

Some authors claim that these should be considered as one tumor, but since no good reason for this has been advanced we have considered them as separate ones.

A considerable degree of interest has centered about the hyaline bodies which abound in the tumor tissues. These bodies first mentioned by Rindfleisch in 1878 were found in large numbers in the mucous membrane of the stomach by Krukenberg in 1890, who called them colloid bodies. Russell studied them carefully and named them fuchsin bodies. Many others have discovered them and attached their own name to them. They have been found in a wide variety of pathological as well as normal tissues as elements of the stroma. Various authors have called them

parasites, lymph coagulation products, cell degeneration products erythrocytes, etc. Dr G. Y. Rusk states that these bodies are merely degenerated plasma cells.

It is interesting to note that diffuse polyposis has been found in animals notably the dog and the horse. A case of polyposis in the horse is reported (Petit et al.) in which the macroscopic and microscopic findings agree with the descriptions given by Menetrier of polyadenoma *en nappe*.

SYMPTOMS AND SIGNS

Gastric polyposis frequently runs a course without symptoms and may be disclosed only at autopsy. When present, the symptoms are the same type as one may meet in any gastric disorder: epigastric discomfort, distention, vomiting, etc. Abdominal pain or distress is by far the most frequent symptom present in 24 cases (28 per cent). Often the patient complains of symptoms which are the result of a long continued severe anemia. The nearly constantly present anacidity often reveals itself by diarrhea; the latter being present in 15 cases (18 per cent). Vomiting, anorexia, constipation and weakness were each present in about 17 per cent. Hematemesis is reported in 7 cases out of the 84 (8 per cent), but death from severe hemorrhage is not known in the diffuse variety of polyposis. In 1 case (Heinz) the lavage water was tinged bright red on several occasions; once after an interval of 2 years. Occult bleeding is much more frequent, having been noted in the stools in 11 cases (13 per cent), thus usually being the result of mechanical injury to the growths. To a certain extent the symptoms depend on the location, size, and form of the tumors. Pedunculated masses and masses about the pylorus are much more apt to produce symptoms than broad based ones and tumors of the greater curvature. A remarkable case of gastric polyposis in an epileptic is reported (Stevens), in which the aura was referred consistently to the stomach.

Reports are at hand of 4 cases of pyloric obstruction caused by gastric polyps. In Cruveilhier's case there was only gastric retention, in Cornil's there was complete obstruction, in Meyer's there was invagination



Fig. 15. Case 4. K. A. W. High power photomicrograph. Typical view of the epithelial growth showing irregular branching gland spaces lined with undifferentiated epithelium containing leucocytes and red blood cells. The stroma contains many lymphocytes and plasma cells. Hematoxylin and eosin stain.

of the pylorus into the duodenum. In this series of cases of pyloric obstruction we are able to add a personal case (Case 5) which occurred in the practice of Dr. T. O. Burger of San Diego who has kindly permitted us to include it in our series. There the obstruction was intermittent, lasting 12 to 36 hours and when present, was associated with severe pain and constant vomiting.

Some of the cases have displayed a remarkably long duration of symptoms without progression. In Wegel's case the patient suffered for 29 years before the condition was correctly diagnosed. In Menetrier's case symptoms were present for 25 years. In one of our own cases (Case 1) the symptoms dated back 25 years, in another probable case, 20 years. In several cases the duration of symptoms was 10 to 15 years. One must conclude, then, that the disease often remains benign for the greater part of its course. In our Case 2, a marked increase in severity of symptoms seemed to correspond to a sudden increase in growth activity displayed by tumors which lay dormant for over 20 years. The repetition of symptoms is not seldom interrupted by



Fig 16 Case 5 A P This picture was taken when the polyp had herniated into the pylorus showing the sharply cut off area at the antrum and pylorus



Fig 17 Case 6 W P Shows defect along greater curvature of stomach Note preservation of old gastric outline



Fig 18 Case 7 A S Large reticular defect in middle of greater curvature of stomach due to either hypertrophied rugæ or polyposis



Fig 19 Case 8 W B Irregularity along the greater curvature extending from the cardia for two-thirds of its length This cannot be smoothed out by pressure



Fig. 20 Case 9 H S Examination after 15 hours fast preceded by gastric lavage shows the stomach not quite empty. This very satisfactory filling demonstrates some large irregularly rounded filling defects over the upper portion of the greater curvature.



Fig. 22 Case 11 N E The roentgenological findings of the stomach were extremely significant. There was a marked irregularity of the greater curvature. At a second examination the irregularity of the greater curvature was proved to be characteristic of diffuse polyposis.



Fig. 21 Case 10 J C Defects shown in gastric outline and in middle portion of stomach in many places. Multiplicity of lesions and maintenance of gastric outline speaks for polyposis. This was substantiated by finding tumor tissue in vomitus.



Fig. 23 Case 12 E K Female age 30 had symptoms lasting 10 to 12 years. History of manifest and occult blood in the stools. Stomach content showed great quantity of mucus, no free hydrochloric acid. X ray typical of polyposis but operation disclosed marked hypertrophic gastritis.

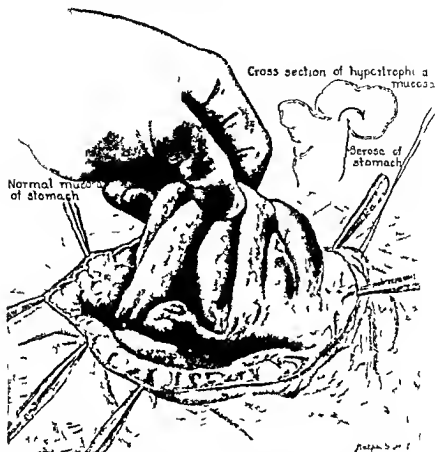


Fig. 24 Case 12 L. K. This shows the enormously hypertrophied folds of gastric mucosa as they are actually being withdrawn from the stomach through the gastrotomy incision. The area of hemorrhage noted in the text is here shown.

remissions of variable duration. Our probable Case 10 enjoyed a spontaneous remission of over 9 years' duration.

In this series of 84 cases objective physical signs were usually lacking having been found in only 9 cases (11 per cent). A palpable tumor was noted in 1 case only. Light cases showed only slight tenderness or a sense of resistance in the epigastrium.

How much of the symptomatology is the result of the polyps themselves and how much of the chronic inflammatory changes which sometimes accompany them is problematical. It has been suggested that the polyps are silent and that the symptoms result from the chronic inflammation alone except when obstruction or some other mechanical factors prevail.

DIAGNOSIS

It is remarkable that from 1830 to 1909 all the cases of gastric polyposis collected from the literature were diagnosed at autopsy. The first antemortem diagnosis was made by Wegel in 1909 operating for a suspected carcinoma of the stomach which had been in correctly diagnosed as such from a piece of tissue expressed through the stomach tube. As in the past so in the present many cases are undoubtedly overlooked because they may remain symptomless over a long period of time and because the symptoms when present are not characteristic. The roentgenogram properly interpreted should overcome this difficulty although in our own series of cases we will show that confusion and doubt may arise from a lack of knowledge of the various



Fig. 2. Case 1. E. K. Low power. Showing 1 cleft in mucous membrane 2 overlying edematous area 3 small cystic dilatation of gland 4 cellular infiltration



Fig. 3. Case 1. E. K. Photomicrograph of surface of mucous membrane showing 1 edematous region 2 cellular infiltration 3 tortuous gland.

changes which may occur in the contour of the stomach resulting from these growths and from the inability to discriminate between chronic inflammatory hypertrophy and neoplasia by the roentgenogram.

Dr. Howard Ruggles, who has seen a large percentage of our cases, offers a personal communication of the roentgenological findings in polyposis as follows: "The characteristic roentgen ray finding in polyposis consists of irregular defects in the margin of the gastric shadow at the site of the tumors which are usually upon the greater curvature. The masses projecting into the lumen produce an indentation in the barium shadow with ragged edges and there is commonly a tendency for a streak of barium to continue along the curvature of the stomach extending through the lesions for a variable distance depending upon the angle at which they are viewed. When a tumor lies directly on the profile of the shadow and has a relatively broad base there will be little or no undercutting visible. When the base of the tumor lies at a slight distance from the profile this tendency of a thin line of barium to follow the gastric outline becomes more pronounced and finally, when the tumor arises from the anterior or posterior

walls, the defect in the margin disappears entirely and the picture is that of a more or less rounded mass lying wholly within the gastric shadow.

"The differentiation from carcinoma is made upon the fact that the defect in malignancy is usually annular involving both curvatures, the gastric wall at the side is obliterated and the defect increases in size fairly rapidly, while the course of the benign lesions is much slower.

"Foreign bodies such as food, hair balls, masses of vegetable fibers and other non-opaque material may be a source of confusion on single examination but repeated observations and changes in position of the patient should differentiate them."

The method of differentiation of benign from malignant gastric neoplasms by the X-ray is well set forth by Moore in this country and by Z. Kalisch, D. Kalisch, and Gassmann in Germany, who lay special emphasis on defects produced by polyps.

Just as in the pathological picture, so in the roentgenograms, there are borderline cases in which one cannot differentiate between hypertrophic rugæ resulting from chronic gastritis and polyposis. This is well exemplified

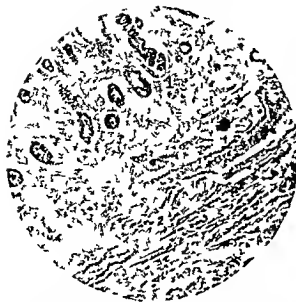


Fig 27 Case 12. Photomicrograph of inner layer of mucous membrane showing 1 general edema and dilation of capillaries 2 extension of infiltration among fibers of edematous muscularis mucosae 3 vessel containing extensive number of leucocytes

by our Case 12 in which the history, laboratory findings and roentgenogram were so characteristic that we were tempted to report this case before operation as proven. To our surprise however we found at operation a marked hypertrophic condition of the mucosa without any discrete growths.

Dr Chamberlain in a personal communication cited a case diagnosed polyposis by X ray which was found at operation and microscopic examination to be one of multiple nodules of lymphosarcoma. He feels that in some cases one cannot make the differentiation between lymphosarcoma and polyposis by the roentgenogram alone. We have not encountered any cases in which the X ray picture was confused with lymphosarcoma.

Carman too warns that the roentgenograms of polyposis may be confused with those produced by vegetable matter retained in the stomach but it is our good fortune to be able to present a case of just this nature confirmed by operation in which Dr Lloyd Bryan was able to differentiate easily these two conditions from the roentgenogram alone (Fig 1) by the fact that the gastric outline was easily traceable and found not to follow the defects

the latter being ragged and not well defined displaying a moth eaten appearance.

P B¹ a Hindu laborer, age 55 years entered the San Francisco Hospital² in August, 1925. His family history was unimportant. Until the age of 40 years he had lived in India. At the age of 48 he had chancre and gonorrhea with secondary rash treated by a doctor with mercury rubs. He had no other diseases and was never jaundiced. Two years ago he suffered from pain between the shoulders radiating down both legs and at about the same time he passed two renal calculi. In addition his physician made a diagnosis of diabetes and since then he has suffered from polydipsia, polyphagia and polyuria for about 3 years he has suffered from a feeling of fullness and tightness in his abdomen at first only after meal but later nearly constant relieved temporarily by belching. This was associated with a dull pain in the right epigastrium which did not radiate. He has also had occasional attacks of nausea and vomiting coming on soon after eating. Vomitus never contained blood. During his illness he has had attacks of diarrhea sometimes 6 to 8 stools daily never bloody nor tarry. Two days before entry he passed two calculi through the urethra. His weight never was over 100 pounds. His weight on entry was 82 pounds.

On physical examination the positive findings were dental caries and pyorrhea, visible active intestinal peristalsis, clubbing of fingers and toes and absence of patellar and Achilles reflexes. No other abnormality was noted in the abdomen. The chest was normal.

Gastric analysis was done on August 18, 1925. The fasting content measuring 15 cubic centimeters was macroscopically and microscopically normal. Chemical analysis showed total acid of 80-85 and free acid 15-30. Blood sugar (fasting) 301 milligrams glucose on August 24, 1925 and 176 milligrams on September 11, 1925. Roentgenological examination of chest and abdomen made August 20 by Dr Lloyd Bryan showed slight dilatation of the arch and ascending aorta, enlargement of bronchial root glands, increase in peribronchial thickening, no delay in esophagus. The stomach large, low atonic showed diffuse irregular and coarse mottling throughout, the outline was not broken, rugae were demonstrated, peristaltic waves normal. The duodenal cap was medium in size and smooth. Re-examination of the stomach after lavage showed irregular coarse mottling throughout. There were no actual gastric defects. Rather marked retention appeared after 6 hours. Roentgenological examination showed no retained foreign material in the stomach. The urine showed a heavy trace of sugar and the occasional presence of acetone; it was otherwise negative. Erythrocytes numbered 4,000,000, leucocytes 6,300, 72 per cent polynuclear neutrophils. Blood Wassermann

This case was reported by Dr Lloyd Bryan at the Dallas Conference of the American Medical Association, 1926. University of California.

mann was negative, examination of stool negative. Diabetic diet regime was instituted.

On September 17, 1925, a futile attempt was made to pass an œsophagoscope under local anesthesia. The following day gastrotomy was performed by one of us and large quantities of vegetable matter and retained food material which could not pass the pylorus were evacuated. The convalescence was uneventful except for slight infection in the operative wound. Blood sugar, September 21, 1925, was 183 milligrams per 100 cubic centimeters. October 4, 1925, he was discharged from the Surgical Service in good condition, the urine being sugar free.

Three months after operation the patient complained that the feeling of tightness in the abdomen and the diarrhea had increased in severity. Roentgenograms taken at this time showed a stomach normal in contour and function, without evidence of retained vegetable matter or any other abnormality (see Fig. 2).

Such examples of phytobezoar are exceedingly rare. Hart, in 1923, collected five cases of bezoar from the literature, some of these, however, being pure hair ball (trichobezoar) or a mixture of hair and vegetable matter (trichophytobezoar). To these Hart added 8 personal cases, all of them phytobezoars, which are very similar to the case reported here, and gave interesting histories and roentgenological views. It is a remarkable fact that in 6 of Hart's 8 cases, there was a definite history of persimmon ingestion. This was not so in our case. It is interesting to note that our case of phytobezoar was a diabetic. Dr. H. C. Moffitt, in a personal communication, recalled two cases of intestinal obstruction in diabetics due to retained vegetable matter. It may be that there is a casual relationship between diabetes and phytobezoar. Hart, however, makes no mention of the occurrence of diabetes in his case reports.

It is noteworthy that in every case in which the X-ray was utilized for diagnosis there was definite abnormality in the roentgenograms. However, a typical case may be overlooked not only by the roentgenologist inexperienced in this condition but actually by the exploring surgeon.

Laboratory investigation often furnishes important data. Next to the roentgenogram, the examination of the gastric content assumes first importance. It is remarkable that of 20 cases in which gastric analysis was performed, free hydrochloric acid was absent in

18 (90 per cent). This finding is even more constant than it is in carcinoma. In only one case was there mention of the presence of ferments. Blood, occult or manifest, was found in the fasting content in 9 cases (45 per cent), tumor particles were found in 5 (20 per cent). A large amount of mucus was present either in the gastric content removed by tube or overlaying the gastric mucosa, in 11 cases. Myer states that achylia and myxorrhœa should always arouse suspicion, especially when repeated fresh blood is found in gastric content removed with care, and that severe acute gastric hemorrhage in a patient with gastric achylia, abnormal mucous production, and normal or increased gastric motility make the presence of the disease more than probable.

Tumor tissue received from the stomach by tube or in vomitus may suggest the presence of gastric polyposis. Wegele, Chosrojeff, Myer, and Heinz reported the finding of tumor tissue which lead to a diagnosis. In Wegele's case, from a microscopic examination of the tissue a diagnosis of carcinoma was made and we had a similar experience in one of our cases (Case 10). The differential diagnosis between polyposis and carcinoma from pieces of tumor tissue will always be uncertain, since such specimens rarely contain the submucosa in which the actual invasion can be demonstrated. Chosrojeff recovered tumor tissue from the stomach of a patient on two different occasions. Myer recovered a gastric polyp from the stools of a patient, in whom he first diagnosed invagination of the polyp through the pylorus and separation from the pedicle. In obscure gastro-intestinal cases and in obscure anemias, gastric analysis should not be neglected and rigid search should be made for tumor particles, the microscopic examination of which may suggest the diagnosis.

In obscure gastric cases which come to the surgeon for treatment, the operator should not be content with inspection of the serous surface of the stomach alone and palpation of the closed viscus, but gastrotomy should be performed whenever possible and the mucosa directly inspected. In this way, many supposedly normal stomachs will be found to be the seat of well advanced pathological change.

In two of the probable cases reported by us, a pre operative diagnosis of ulcer led to the performance of a gastro enterostomy in one and a pylorotomy in another, overlooking the presence of gastric polyposis.

Schindler in 1922, reported the first and only case diagnosed by gastroscopy. Were it used more frequently this method would probably become a potent means of diagnosis not only of polyposis but of other diseases of the stomach.

With the above facts available the diagnosis of gastric polyposis should rarely be overlooked and the number of case reports will undoubtedly mount quickly in the future.

PROGNOSIS

Statistics which bear on prognosis important as they are are very inadequate principally because most of the cases have been diagnosed postmortem. Death has rarely been the direct result of the presence of the disease. That these growths are essentially benign is conceded by all the importance of gastric polyposis lies more in its tendency to undergo malignant change. Wechselsmann claims that 50 to 60 per cent of cases of polyposis of the entire gastro intestinal tract become malignant and that it is unusual for a case to remain benign until death. Doering claims that 46 per cent of cases in which the entire gastro intestinal tract is affected are associated with carcinoma and that most of these occur between the ages of 15 and 35 years after 4 years only one patient a girl of 15 years was alive. Statistics which involve the stomach alone are few and inadequate. Meulengracht states that 50 to 60 per cent of intestinal polyps undergo malignant degeneration, but that in the stomach malignant change seldom occurs and is not the rule. Less than 17 per cent of his cases showed malignant degeneration. Mills reports that only 4 cases in 20 were malignant. In our collected statistics 12 per cent showed malignant degeneration.

One must not lose sight of the fact that in the examination for malignancy only a small portion of the entire specimen is utilized and that outspoken malignant changes may lurk in an unexplored field. Again, it is often ex-

tremely difficult, in borderline cases, to determine definitely whether or not a tumor has actually become malignant. Most pathologists agree that invasion of the submucosa by epithelial elements is evidence of carcinomatous change. There are those however who claim that the type of cell and its arrangement are sufficient, that the change from orderly functional, single layered epithelial cells to undifferentiated metaplastic, polymorphic, many layered cells, without evidence of function proclaim the malignant change. Miller reports a case of unquestionable metastasis in a case of malignant polyp of the stomach in which he was unable to demonstrate deep invasion in the primary growth. Rosenbach and Disque claim that malignant degeneration occurs more often in broad based polyps. In our personal series the diagnosis of malignancy was made to rest on actual invasion of the submucosa.

TREATMENT

Deductions of treatment from present statistics are premature in view of the small number of cases diagnosed before death. Douglas allowed his patient to swallow a capsule of radium tied to a string which was left in the stomach for 6 hours with frequent change of position, the patient died in 3 months.

X ray therapy was employed on one of our personal cases (Case 10) with considerable improvement. In the case reported by Struthers therapeutic X ray treatment was also used, with relief from all symptoms for 3 months, after which time the symptoms returned increased in severity, although the roentgenogram showed no signs of progression of the disease. One cannot be sure however, whether an etiological relationship existed between the procedure and the improvement or whether the latter was a coincident spontaneous remission such as is not unusual during the progress of the disease. No other reports of non surgical treatment have been found.

The liability of these tumors to develop into malignancies argues strongly for radical surgical procedures. As much of the tumor bearing area should be excised as possible. The remaining tumors should be individually

excised, their bases cauterized thoroughly, and the defect in the mucosa closed by suture. The nature and extent of the procedure, of course, will depend on the condition of the patient. If transfusion is necessary it should be done several days before operation, to avoid the added shock of possible transfusion reaction (see Case 4). Local anæsthesia with or without splanchnic block is the most satisfactory anæsthetic.

PROVEN CASES

CASE 1 V. T., an Armenian laborer, age 62 entered the Surgical Service of the University of California Hospital in January, 1921, complaining of weakness, shortness of breath, loss of appetite, and nausea after meals. His family history was unimportant. He had gonorrhea three times, once complicated with suppuration of the inguinal glands, chancre at the age of 32, treated only with cautery. He gave no history of secondary syphilis, but 20 years later he was cured of skin lesions by intravenous administration of salvarsan, following the discovery of a positive Wassermann reaction in the blood. Four years ago he was operated upon for the relief of prostatism. His gastro intestinal history dates back 25 years (aged 37), when he was confined to the St. Helena Sanatorium for 7 weeks because of "stomach trouble," weakness, nausea, and the loss of 40 pounds in weight in 2 months. At that time gastric analysis showed absence of free acid. Since then he has been subject to attacks of pain about the umbilicus, and nausea, especially about 1 to 2 hours after consuming meat or large amounts of food. Five months ago he noticed that the nausea and pain became more severe and constant, and occurred soon after ingestion of food (15 to 30 minutes), he desired to vomit but never did. Very light meals were not followed by nausea. At the same time he began to experience marked weakness and shortness of breath on exertion and noted that his ankles would swell at night. He has been constipated for years never noticed bloody or tarry stools. Physical examination showed marked dental caries, generalized arteriosclerosis, abdomen normal except for a questionable, tender mass just below the xiphoid which does not move with respiration, slight edema of the scrotum. Otherwise examination was negative. Laboratory findings: Blood, examination showed hæmoglobin, 60 per cent, red blood cells 3,104,000. The urine was normal. Gastric analysis showed occult blood in fasting content, no free acid, numerous leucocytes, few gastric epithelial cells. The stomach was washed with saline solution. The wash water contained many fragments, occult blood, positive, centrifuged specimen showed many erythrocytes and polymorphonuclear cells. The Wassermann was negative. Roentgenological examination showed a wide aortic arch, the

stomach rather small and high and no masses present. The lower end of the stomach was funnel shaped and slightly irregular, cap normal. From roentgenological examination a diagnosis was made of early carcinoma of the antrum. Examination of stools showed occult blood present (two examinations).

A pre operative diagnosis of carcinoma of antrum, with metastasis to the head of the pancreas was made. Operation was done by Dr. S. Pope January 8, 1921. An old ulcer at the pylorus was found. The remainder of the stomach was normal to palpation. The pyloric musculature was markedly thickened. Treatment included a Mayo Pólya resection of the pylorus. Pathological report stomach ulcer, no evidence of malignancy (Dr. Bartlett).

The patient had an uneventful recovery and was discharged cured, February 3, 1921. Diagnosis: Ulcer of stomach.

On October 4, 1921, the patient entered the San Francisco Hospital. Following his discharge from the University Hospital, he enjoyed transient relief for a few months, during which he gained 15 pounds. One month before entry his gastric symptoms returned, increased in severity. He suffered from a raw feeling in his epigastrium, sometimes even a sharp pain, nausea was marked, but he did not vomit. He had tarry stools at irregular intervals. Although his appetite was good, he feared to eat. In January his weight was 160 pounds, now it is 152 pounds. Physical examination revealed an anæmic man, suggestive of the pernicious type of anæmia. Except for vague resistance in the epigastrium and tenderness here on deep palpation there were no important signs. Examination of the blood showed hæmoglobin 55 per cent (Dare), red blood cells 4,160,000.

Roentgen examination, October 10, 1921 (Fig. 3) showed no evidence of pathology in the chest, no delay in the œsophagus, no cardiospasm. The stomach was small and high and the antrum had been re-ected and united directly to the duodenum. Through this opening the stomach was emptying rapidly. No peristaltic waves were visible. Arising from the middle third of the greater curvature was a lobulated irregular mass. At the site of the attachment, the greater curvature was broken up into small thin lines but was not totally absent as is true in a case of malignancy. From roentgenological examination a benign polypoid growth was diagnosed. Pre-operative diagnosis was gastric polyposis. Operation was done by one of us, San Francisco Hospital, October 11, 1921. A right rectus approach was used. Adhesions were everywhere. The gall bladder was normal. Several firm glands, about the size of a lima bean, were palpable in the mesentery. One was removed for examination. Anterior gastrotomy was performed. The hand was introduced, and a soft, foul, necrotic, greyish mass of polypi about the size of an orange was delivered. The surgeon's impression was that it was a benign growth. The polypi were excised.

with scissors and the base cauterized thoroughly with the actual cautery the defect in the mucosa being closed by suture. The gastrotomy was repaired. The patient left the operating room in shock. A gradual downhill course led to death on the second day following operation.

Pathological report. Gross. The specimen consists of a large irregular mass 5 1/2 by 5 1/2 by 4 centimeters and half a dozen smaller masses. The large mass is deeply fissured the surface in part finely nodular, projecting from the greater part of the surface are numerous fine delicate finger like processes so that the mass as a whole resembles coral on section the tissue is of spongy consistency rather soft and friable without any apparent marked vascularity. Made up of small pale brown opaque irregular areas. Included with the specimen is a small firm flattened node of 1 by 1 by 0.5 centimeter which on section shows no gross tumor involvement. Microscopic. Sections taken from the large nodule and from several of the smaller nodules show a rich papillomatous growth of which the papillae are sometimes long and thin at other times shorter and thicker. These are covered for the most part by a single layer of columnar epithelial cells with protoplasm taking a medium deep stain and nuclei that tend to be elongated. Some of the epithelial cells contain a single large clear vacuole in the superficial portion of the protoplasm thus resembling goblet cells. In other places the epithelium shows a tendency to pile up into several irregular layers. Mitotic figures are everywhere numerous. In the central portions of the sections are found spaces usually small lined by epithelial cells similar to those covering the papillae the spaces frequently containing degenerating leucocytes most of them polymorphonuclears. They may represent glandular structures though some may be cross sections of the deeper portions of crypts. The stroma of the papillae is composed of connective tissue frequently areolar and edematous in appearance particularly that in the distal portions of the papillae. Everywhere the stroma is filled with large numbers of cells including plasma cells lymphocytes and polymorphonuclear leucocytes. The stroma of the central and more solid parts of the growth contains in addition some small bundles of smooth muscle fibers. In the spaces between some of the papillae there are leucocytes and cellular debris and also occasionally a small amount of some faintly staining material resembling mucus. Small quantities of similar material are found in the tumor stroma particularly in the central portions. Considerable areas of necrosis are present involving chiefly the superficial surface of the growth and associated with marked fibrin formation and polymorphonuclear leucocytic infiltration the exudate frequently extending deeply inward between the papillae. Section through the lymph node included with the specimen shows sinuses filled with leucocytes including numerous lymphocytes neutrophils and eosinophiles. There is also a slight diffuse increase in connective tissue but nowhere is

there apparent any tumor involvement. Diagnosis. Adenocarcinoma of the stomach. (Dr Perkins)

Certain peculiar circumstances attend this case. There is a definite history of achylia dating back over 25 years, but at the first operation nothing abnormal was noted by palpation, except a thickening of the pylorus. There was a small, old, healed ulcer which was excised. This operation relieved his symptoms for only a short time. Nine months later, a second operation revealed enormous polypoid masses evidently of long duration. It is possible that polypoid growths had been present for 25 years giving marked symptoms, that these were not recognized on account of their size or consistency at the first operation and that superimposed malignant degeneration was responsible for the recent rapid growth.

CASE 2. A. R., an Italian male, age 42 years entered the Medical Department of the University of California Hospital on the private service of Dr W. J. Kerr on March 5, 1924 with the complaint of weakness and gas pains. His family history was unimportant. For 2 years he suffered burning non radiating pain about 1 inch above the umbilicus coming on about 2 hours after meals and relieved by food and alkali. A few days after the onset of symptoms he passed tarry stools. Four months ago he began to vomit the first evening he passed tarry stools the next morning he vomited changed blood. On two occasions shortly after the attack he vomited fresh blood. Since then he has had a progressive increase in severity of epigastric pain and burning and he has noted considerable pallor, weakness, dizziness on sudden movements, palpitation and buzzing in the ears. He is chronically constipated and has had hemorrhoids for a long time. He has lost 7 pounds in weight in the last 4 to 5 months. He had gonorrhea at the age of 32. He denies syphilis. Physical examination was negative except for dental caries and pallor. The abdomen showed no masses, rigidity, tenderness nor peristalsis. Examination of the blood showed marked hemoglobinemia 34 per cent. The urine showed 7 to 10 pus cells per high dry field with lightest possible trace of albumin. Blood Wassermann gave a 4+ reaction spinal fluid normal. Examination of the stools showed benzidine test positive on two occasions. Gastric analysis disclosed some gross blood in the fasting content. The passage of a tube elicits pain over the hypoid which persists as long as tube is in. No free hydrochloric acid. On first examination the roentgenograms showed a constant irregularity in the immediate prepyloric region and greater curvature over which peristaltic waves do not pass. cap showed constant irregularity. (Dr Thom.) On

second examination (Fig. 4) there was noted a large, indented area near the middle of the greater curvature with several polypoid growths projecting into the lumen. There was a lack of filling in the immediate prepyloric region, apparently due to polypoid growths. Roentgenological conclusion: polyposis of the greater curvature and prepyloric region, possibly luetic (Dr. Ruggles). Two intravenous injections of salvarsan were given without marked improvement.

Dr. J. H. Woolsey was called in consultation. The patient was transfused with 500 cubic centimeters of citrated blood. The following day (March 25, 1924) he was operated upon by Dr. Woolsey, one of us assisting. The preoperative diagnosis was gastric polyposis. Nitrous oxide anesthesia was given. A right rectus incision was used. The abdominal contents were negative except for the stomach and a few adhesions in Morrison's pouch; the duodenum was dilated in size by about one quarter. The stomach serosa was normal. The gastric wall was thickened along the greater curvature from the junction of the distal and middle thirds to the cardiac orifice, it was not indurated but had a definite edge. There were a few small lymph glands along the greater curvature. Anterior gastrotomy made possible direct inspection of the entire mucosa, which was markedly hypertrophic and transversely by deep folds varying from one quarter to 1 centimeter in depth. The changed areas involved the entire upper portion of the stomach, even about the cardiac orifice in raised reddish brown plaques of various sizes with definite edge, showing punctate hemorrhages and superficial ulceration. The mucosa was covered with a considerable amount of mucus. Partial gastrectomy of about the middle half was performed. The affected areas in the upper quarter could not be removed, and gastrogastrostomy was done. The patient stood the operation well and left the operating room in good condition. Postoperative course was complicated by the development of an omental abscess which was incised on the eighteenth day after operation, otherwise convalescence was uneventful and the patient was discharged May 6, 1924, much improved with a haemoglobin of 46 per cent and a consistently negative benzidine test in the stools. Roentgenological examination made some time after operation showed the stomach fairly normal with the operative wounds scarcely discernible, there was a small irregular area high up on the greater curvature which probably represented some of the localized hypertrophy of the mucous membrane still some irregularity of the cap (Dr. Thom). On August 4, 1924, the haemoglobin was 60 per cent. The patient was feeling well, tolerating a regular diet. Anti-syphilitic treatment was being continued.

Dr. Woolsey informed us in January, 1926, that the patient was symptomless and tolerated a regular diet. There was no occult blood in the stool. The haemoglobin and erythrocyte counts were normal.

Pathological report. Gross (See Fig. 5). The specimen consists of a portion of the stomach wall

measuring 10 by 12 centimeters. The mucosal surface is thrown into large, heavy roughened folds measuring about 1 centimeter across and projecting about 1 centimeter in height. There is only one small area on the edge of the specimen showing any resemblance of normal mucosa, and here the tumor ends abruptly. The other edges seem to have been cut through the tumor mass. The surface of the tumor shows areas of dark brown discoloration, probably the site of hemorrhages. There is some fibrinous material here and evidences of superficial ulceration. Cut section reveals a stomach wall about 2 centimeters thick divided into three layers. The mucosa is in preserved state sharply demarcated, hard, yellowish white, and about 3 millimeters in thickness. The submucosa is about 1.5 centimeters thick and is composed of loose, white, cottony material. The muscle layer is about 3.4 centimeters thick. The peritoneal surface is smooth, has some fatty attachments but no adhesions are seen. Gross impression: Gastric polyposis (papillomatosis). Microscopic examination (Figs. 6, 7, 8) of the sections shows an exaggeration of the normal pattern of the stomach mucosa. The glands are greatly elongated. The epithelium is made up of high columnar type of cells in orderly arrangement. The chief and parietal cells at the base of the gland are clearly differentiated. The basal membrane of the glandular structures is everywhere intact. The stroma is diminished and contains many leucocytes, both mononuclear and polymorphonuclear. Diagnosis: Gastric polyposis (papillomatosis) with infection. Described by A. E. Larsen (Dr. Bartlett).

Although the impression of the microscopic picture was one of normal stomach, except for the presence of mild chronic inflammatory changes, there was noted a rather unusual increase in the number of the chief cells, which seemed to be larger and more undifferentiated than usual. For purposes of further study new sections were made from the specimen. In these Dr. Rusk found a remarkable picture of dilated spaces in the mucosa, especially toward the lumen, filled full with red blood cells, and lined with cells which strongly suggested endothelium. Special sections were prepared by Dr. Rusk, according to the method of Van Gieson, and the endothelial nature of these spaces confirmed. The raised, red areas then were not epithelial growths, but belonged to the class of telangiectasis. Telangiectasis of the stomach is a very rare condition, but not unheard of. No textbook mentions that such a condition occurs. At the present time we are not prepared to give any further data on this subject. A

similar case of polyposis was reported in 1820 by Monfalcon in which he speaks of a structure resembling that of the corpus cavernosum. It may be that some of the cases reported as polyadenoma *en nappe*, were cases of telangiectasis of the stomach.

CASE 3. E. F. a German clerk, age 58 years, consulted Dr. Bertram Frohman on August 12, 1924, complaining of shortness of breath, loss of weight and strength, and swelling of the ankles. Family history showed no hereditary taint. He had one attack of gonorrhea 3 years ago, he denied syphilis. Fifteen years ago he had an attack of ptomaine poisoning thought to have been due to ingestion of fish. Two years ago he had a slight attack of "biliousness" at which time he noted dark stools since then he has had no gastrointestinal disturbances. For several months he had been told that he looked pale. His present illness began 2 months ago when he first noticed swelling of the ankles at night, shortness of breath and loss of strength. Fluoroscopy taken at the request of Dr. Nelsen of Oakland revealed marked filling defects on the greater curvature, one near the cardia the other 4 centimeters below.

Physical examination was negative except for cachexia, an old lesion with occasional mucous râles at the right pulmonary apex and functional aortic and mitral murmurs, moderate distention of the abdomen with slight tenderness and moderate muscle guarding about 2 fingers breadth above the umbilicus. No masses were felt. He showed a light edema of the ankles. Rectal examination was negative.

Examination of the blood showed hemoglobin 40 per cent. Talquist and Sahli erythrocytes 2,800,000. Occult blood positive was found in the stools. In the urine an occasional pus cell. Blood Wassermann gave a negative reaction. Roentgenological examination of the stomach showed two large rounded defects near the greater curvature, one 2 inches below the cardiac opening, the other in the body of the stomach. From the X-ray examination a diagnosis was made of papillary tumors of the stomach which may be benign (Dr. Ruggles) (Fig. 9).

In attempting to secure gastric content for analysis following an Ewald meal fresh blood was encountered in the second specimen. On withdrawing the tube a small piece of necrotic tissue was found adherent to it. This was examined microscopically by Dr. Oliver and a diagnosis was made of papillary epithelial growth, probably malignant. There was no free acid in the specimens. Diagnosis: Cancer.

The patient entered Mt. Zion Hospital. One of us was called into surgical consultation. The roentgenograms were again inspected. They showed defects which encroached on the lumen with partial preservation of the shadow of the stomach wall. In view of our experience with the previous cases it was thought probable that this was a case of polyp which may have been benign. A pre-operative diag-

nosis was made of gastric polyposis. Pre-operative preparation included an injection of 10 cubic centimeters of 5 per cent calcium chloride intravenously and 20 cubic centimeters of whole blood intramuscularly daily for 3 consecutive days. On the morning of operation, by a partially successful attempt to transfuse whole blood by the Kiamptom Brown method, 150 cubic centimeters were given. This was supplemented by transfusion of 500 cubic centimeters of citrated blood and 250 cubic centimeters of Ringer's solution intravenously given before and during the operation. Operation was performed by one of us on July 19, 1924 at Mt. Zion Hospital. Local anesthesia was induced with one half per cent novocain with adrenalin. Operation was done through a right midline approach. The diseased condition was confined to the stomach and to an enlarged gland about 1.5 centimeters in diameter on the greater curvature, the latter probably inflammatory. The gastric serosa was normal. Through the stomach wall could be palpated several large tumors. Further anesthesia was induced by intra-abdominal splanchnic block. Anterior gastrotomy was performed. Nearly the entire lumen was encroached upon by large soft grapefruit sized cauliflower like reddish brown tufted tumors, the surfaces of which were studded with ulcerated and necrotic areas. At first inspection, it was thought that this was one large tumor but it was finally determined that it was composed of four closely placed tumors (Fig. 10). The largest the size of a fist was on the greater curvature near the posterior wall, and showed numerous necrotic and ulcerated areas. The next largest the size of a small fist, situated only a little distal was separated from the larger polyp by a strip of normal appearing mucosa one inch wide. A third large polyp about lemon size, and a fourth the size of a walnut rested on the lesser curvature in the fundus. There were about five small pedunculated polyps the size of a pea, surrounding the pylorus. The intervening mucosa appeared normal. Each of these masses was removed by cautery irons, the large ones first being clamped at the base. As the clamp was removed bleeders were ligated and the base thoroughly burned out. Defects in the mucosa were closed with suture. The gastrotomy was repaired and closure effected in the usual manner by a double row of catgut sutures and reinforcements of Pagenstecher. The patient stood the operation well. Postoperative course was complicated by a malarial infection otherwise uneventful. Two months later roentgenological examination showed the lower third of the stomach contracted somewhat funnel shaped and slightly irregular in outline. There was no actual filling defect, the stomach emptied very rapidly with a large smooth cap. The patient steadily improved, appetite became good, blood improved but still remained below par, no gastric symptoms appeared.

Pathological report. Microscopic examination (Fig. 11) from several areas of papillomatous mass from the stomach shows in the more superficial parts a

number of relatively thin papillomatous processes covered by epithelium varying from one to several layers thick supported on a thin strand of stroma containing blood vessels, scattered lymphocytes, and plasma cells lying in a small amount of connective tissue. Farther in, the epithelial hyperplasia becomes more marked, takes on an infiltrating papillary adenocarcinomatous pattern. The amount of the stroma shows much more extensive infiltration with lymphocytes and plasma cells and in certain areas there is considerable overgrowth of fibrous tissue, at least, relatively a large amount in proportion to other portions of the growth. The epithelium forming the new growth is of high columnar type. Where it occurs a number of layers thick, there is a tendency for secondary lumina to form. The cells stain diffusely, show sharply outlined nuclei with relatively little chromatic material, but each with a conspicuous nucleolus. Cells in mitotic division are not infrequent. Diagnosis: Papillary adenocarcinoma (G. Y. Rush).

On August 1, 1925, the patient reported complete absence of gastric symptoms. His weight was about the same. Fluoroscopy showed the lower one third of the stomach slightly contracted and a very slight irregularity of the lesser curvature just inside the pylorus, suggesting recurrent carcinoma or post-operative changes (Bryan). The stool showed occult blood on two examinations. The blood showed a very slight anemia. The urine was normal.

August 12, 1925, he complained of slight loss of strength but no gastric symptoms. At this time his hemoglobin was 80 per cent, erythrocytes 3,500,000. Gastric analysis again showed absence of free hydrochloric acid. Occult blood was demonstrated in the stool. Considerable improvement was secured under iron cacodylate injections and calcium lactate by mouth.

In September, 1925, he first complained of a tumor mass at the site of the operative scar. The mass was just to the left of the midline, midway between the ensiform and the umbilicus, of spherical form, measuring about 3 inches in diameter, firm, fixed and not tender, its median portion seeming to infiltrate the abdominal wall where, as a smooth, knob-like prominence 1 inch in diameter, it could be easily seen and felt, just beneath the skin. The lateral portion was much more irregular and was gradually lost in the deeper portions of the abdomen. X-rays taken at this time by Dr. Frohman showed a large defect on the greater curvature which gave the impression of recurrence in the stomach. No gastric symptoms were present.

October 14, 1925, he again complained of weakness. Hemoglobin was 60 per cent, erythrocytes 3,200,000. He again responded to medical treatment. No gastric symptoms were present.

December 11, 1925, he reported normal weight and physical condition.

December 23, 1925, 17 months after operation, X-rays by Dr. Lloyd Bryan showed a large irregular defect involving the lower half of the stomach in

the region corresponding to the palpable mass, probably malignancy (Fig. 12). The patient looked the picture of health and complained of no symptoms. Although the roentgenogram and the character of the mass spoke for malignancy, it was felt that the defect noted by X-ray may well have been due to benign recurrences, especially in view of the appearance and history of the patient, and further operative procedure in the near future was contemplated.

CASE 4. R. A. W. A Canadian lumberman, age 45 years, consulted Dr. Leroy Briggs complaining of stomach trouble, loss of strength, loss of appetite, vomiting, fainting spells and dizziness. Except for the fact that his mother died of tuberculosis when he was 14 years old, his family history is of no importance. For 15 years he has consumed alcoholic beverages excessively once a week. He had gonorrhea at the age of 22 and underwent a course of salvarsan treatment at the advice of his physician.

Except for the above he was perfectly well until one and one half years ago, when he began to have an "all gone feeling" in his epigastrium about 1 hour after meals, associated with belching which usually relieved it. At this time he first began to notice dizziness on sudden change of position, especially on stooping over. Six months ago, nausea and vomiting were added to the above complaints. Eructations would sometimes take the place of vomiting attacks. The vomitus was extremely sour, often stringy, but he has no knowledge of ever vomiting blood or coffee ground material. He has had a craving for sour foods but their ingestion always produced vomiting. The gastric symptoms were more constant on a full stomach. Constipated for years. Never noticed tarry nor bloody stools. Since the onset of these symptoms, there has been progressive weakness. Attacks of dizziness when things turn suddenly black began about a year ago and are becoming progressively frequent. Six months ago he had an attack of glossitis lasting 2 months. He lost 16 pounds during the course of his illness, although his present weight is 6 pounds more than his weight 6 months ago.

The important physical findings were as follows. Patient was very pale, almost cachectic. The right pupil was slightly greater than the left. The tongue was normal. The chest was normal except for signs of an old process at the left apex. The abdomen was level, symmetrical, tympanitic. Except for slight tenderness over the gall bladder region, the abdomen was normal. No masses.

Examination of the blood showed hemoglobin 52 per cent, erythrocytes 1,750,000. The smear showed marked anisocytosis and poikilocytosis, with marked polychromasia with a fairly large number of myeloblastic cells, the whole picture strongly suggesting pernicious anemia. The white blood cell count was 4,800, 72 per cent polymorphonuclears. The urine showed fairly numerous hyaline casts, an occasional cellular cast. The blood Wassermann was negative. Gastric analysis showed a considerable amount of mucus in the first three specimens. The fourth specimen showed a fresh blood clot, which was examined

microscopically in the hope of identifying tumor tissue but none was found. No free acid was found in any specimen. Fasting content contained no pepsin nor renin, no tumor tissue. Microscopic examination showed red cells and occasional pus cells, no unusual bacteria. The stools were negative for occult blood. Roentgen ray examination was made October 2, 1924 (Fig. 13). The lung fields were clear. The heart and arch were normal. The diaphragm moved well and equilly. No delay was detected in the esophagus nor regurgitation through the cardia. The stomach was in good tone, moved freely, the entire outline was rather hazy. There were multiple rounded punched-out areas throughout the gastric outline. One of these was on the lesser curvature at the upper margin of the pars media. There was another one near the lesser curvature in the pyloric antrum region. The outline of the stomach was preserved and not destroyed as would be the case in the presence of a carcinoma. The entire pyloric antrum region was deformed by finger-like projections into the lumen. The duodenal cap was of medium size and smooth in outline. Descending duodenum was normal. At 6 hours there was no gastric residue. The 6 hour meal was in the terminal ileum and caecum which were freely movable, separable and not tender. From the X-ray examination a diagnosis of multiple gastric polyposis was made (Lloyd Bryant, M.D.).

The presence of gastric achylia, fresh blood in the stomach content, the large amount of mucus and finally the roentgen examination left little doubt that we were dealing with a case of multiple polyp of the stomach which may have been benign.

One of us was called into surgical consultation. After inspection of the roentgenograms and in view of experience with previous cases a pre-operative diagnosis was made of gastric polyposis. Immediately before operation patient was transfused with 500 cubic centimeters of whole blood previously cross agglutinated as well as typed. Operation was performed by one of us at Mt. Zion Hospital, October 30, 1924. The abdomen was entered through a straight upper midline incision, the site previously having been blocked by a local administration of one half per cent novocain. A normal liver presented 2.5 centimeters below the costal margin. The gall bladder and bile passages were normal. The stomach was free of adhesions. The serosa was normal. Through the gastric wall could be palpated several small soft pedunculated masses projecting into the lumen. The splanchics were then blocked intra-abdominally with 70 cubic centimeters of 1 per cent novocain. A linear gastrotomy on the anterior wall midway between the curvatures allowed direct inspection of the mucosa (Fig. 14). The lower third of the stomach was diffusely involved with soft, reddish brown, hazel to walnut sized growths confined to the mucosa and freely movable over the subadjacent layers numbering 12 to 14. The highest growth measuring about 1.5 centimeters was situated at about the middle of the lesser curvature, the lowest

was at the pylorus where there was a group of three or four. The largest growth measuring about 2.5 centimeters in diameter rested on the greater curvature just below its middle and displayed areas of superficial ulceration and punctate hemorrhage. Similar areas were noted at the summits of some of the other polyps. Most were pedunculated, shaggy and tufted, some were broad based. The intervening mucosa was thrown into somewhat hypertrophic folds separated by fairly deep furrows with a tendency to run in a direction parallel to the pylorus. Otherwise the tumor free mucous membrane appeared normal. The gastrotomy was then closed and the entire tumor bearing area except the area bearing the highest polyp was removed. This tumor was thoroughly excised, care being used to remove all its base, and the defect in the mucosa was closed by suture. The gastro intestinal tract was then re-established by gastroduodenostomy according to the Billroth I method. Anesthesia was good and patient took the operation well.

That evening the patient developed fever. Early the next morning the temperature went to 106.4 degrees by axilla and was associated with marked respiratory distress. The abdomen was surgically in good condition. There had been no vomiting nor gastric distress. The only symptom of moment had been cough with mucopurulent expectoration (Patient had chronic bronchitis). Chest was full of coarse rales. No signs of pneumonia were present. Patient was stuporous, respirations were rapid and labored with occasional periods of apnea. The pulse remained good. He seemed to be dying of respiratory failure due to hyperpyrexia. A startling improvement in respiration, temperature and mental condition began 5 minutes after the use of ice packs and colonic flushes of ice. In spite of stimulation of the cardio-respiratory center by all accepted means the temperature began to climb again, the course was progressively down hill and death occurred on the third day following the operation. These peculiar circumstances which surrounded his death were attributed to the addition of a transfusion shock to the shock of a severe operation. There was no autopsy.

Microscopic examination (Fig. 15) has been made from the largest polyp like mass of stomach, the one showing ulceration and also the mass that was removed separate from the main mass. Sections have also been examined from a number of lymph nodes and adjacent to the stomach certain masses of fatty tissue that felt slightly firmer than the general mass. Sections from the largest mass show superficial ulceration beneath which is a growth varying greatly in appearance in different areas. In some areas there is a more or less adenomatous structure the epithelium of which varies from one to several layers thick. Cells diffusely and fairly deeply polymorphonuclear leucocytes occur in the gland lumina in places the interstitial tissue shows extensive infiltration with lymphocytes, plasma cells and eosinophiles. In other areas the adenomatous appear

ance is less marked, the glands taking on a much smaller size and are rarely replaced by solid epithelial plugs among the epithelial cells mitosis is not infrequent, the growth breaks through the muscularis mucosa giving an infiltrating carcinomatous appearance with large acini in some places and small diffusely infiltrating ones in others

Sections from the mass removed secondarily show in general, the markedly adenomatous structure with great variation in the epithelium these sections, however, do not definitely show infiltration beneath the muscularis mucosa

Sections from lymph nodes and fat are negative for invasion by cancerous processes Diagnosis Adenocarcinoma of stomach occurring in connection with multiple polypoid masses (G Y Rusk)

CASE 5 A R A single, American woman of 50 years, consulted Dr T O Burger of San Diego on June 9, 1923, complaining of vomiting abdominal pain, and weakness Her family and past history were of no significance For several years she has had gastro intestinal complaints At the onset there was only indefinite distress For many months she has been losing weight and color At the same time the distress, "like a ball in the stomach," became gradually more frequent and more severe especially during the past 3 months and after the morning meal More recently she has had periodic attacks of vomiting of 12 to 36 hours' duration associated with severe abdominal pain, during which everything ingested was eventually vomited, the vomiting becoming more frequent On one or two occasions the vomitus showed small amounts of fresh blood She has been below her normal weight for several months and has lost 20 pounds recently

On physical examination absolutely nothing abnormal was found except pallor The abdomen showed nothing unusual The gastric content was examined on two occasions (January 13 and April 18) On the first occasion the fasting content contained occult blood free acid was absent but ferments were present On the second occasion the fasting content showed much blood free acid was absent until one and one quarter hours, when only a trace was found The stool was positive for occult blood on several occasions The hemoglobin varied from 50 to 80 per cent (S) The urine showed a trace of albumin was positive for diacetic acid and acetone and contained hyaline casts leucocytes, and erythrocytes The blood was Hermann was negative

Röntgenological examination on three occasions revealed entirely different pictures In the first the pylorus was gaping and peristalsis practically absent In the pars media in the greater curvature was a filling defect about 5 by 10 centimeters which had finger like cauliflower projections involving nearly one third of the greater curvature The antrum and pylorus were smooth The stomach was freely movable The duodenal cap was normal in outline not fixed nor tender On the second examination 10 days later, the stomach showed capacity diminished to 1. ounces There was a constant filling defect of

the pyloric third, and the pyloric ring, antrum, and duodenal bulb could not be clearly demonstrated at any time (Fig 16) A fine line of barium marked the narrow isthmus through the pylorus There was a moderate tenderness corresponding to the pyloric end of the stomach but no mass was palpated After 6 hours the stomach was faintly outlined with some retained barium, but most of the meal was in the terminal ileum The patient vomited about 8 ounces of the fluid prior to the 6 hour examination Films taken during the first examination when the patient was not vomiting showed the stomach not blocked, with polypoid masses lying quietly in the stomach Those taken during the second examination at a time when vomiting and pain were present showed a berration of the polypoid tumors into the pylorus completely blocking the passage

The patient was operated upon June 11, 1923 at Mercy Hospital, San Diego, California, by Dr Burger Pre-operative diagnosis (made by X ray) was tumor of the stomach Nitrous oxide oxygen and ether anesthesia was used The abdomen was opened and explored Pathological findings were confined to the stomach Through the stomach wall could be palpated an irregular tumor mass in the pyloric region the outline of which could be seen Gastrotomy was performed through normal gastric wall, and the mass avoided Direct examination of the mucosa revealed a number of firm, finger like polypi of various sizes and shapes some slightly pedunculated, others sessile, all covered with normal gastric mucosa which showed slight erosion The polypi could be easily pushed forward so that they filled the pylorus Each polyp was grasped and removed individually by actual cautery, care being used not to perforate the serosa The bases were closed over with chromic catgut when deemed necessary In all, twenty five to thirty polyps were removed The gastrotomy was repaired and the abdominal incision closed in the usual manner Postoperative diagnosis multiple polyposis of the stomach *Microscopic report* adenoma fibroma Except for a left iliac phlebitis which developed on the third day the postoperative convalescence was uneventful The stool was positive for occult blood in January 1924 The patient gained weight and was free of symptoms following her operation The result of the phlebitis was the only source of annoyance

PROBABLE CASES

CASE 6 W F An American miner, of 56 years entered the University of California Hospital April 27, 1921, complaining of abdominal pain and constipation The mother died at age of 68 years of intestinal obstruction otherwise the family history is unimportant He mined for quartz 4 years, for lead and arsenic 3 years, for gold and silver 23 years In 1917 he had arsenic poisoning He has had numerous attacks of tonsillitis since childhood Otherwise his past history was not noteworthy

The first gastro intestinal symptoms occurred at the age of 35 when he had attacks of 'heart burn'

and indigestion, aggravated by the ingestion of steaks or fruit. For many years he has had an uncomfortable feeling in the epigastrium after meals, relieved by belching gas. About 6 months ago he began to have a full feeling in the epigastrium about 1 hour after meals lasting 2 to 3 hours and not relieved by food. Four months ago this changed to a burning sensation aggravated by food. These symptoms increased in severity until 3 weeks ago when he had a sudden sharp non radiating pain in the epigastrium about 2 hours after a meal. This left him with a dull aching pain coming on about 1 hour after meals and lasting 3 to 4 hours associated with considerable distention often relieved by soda but aggravated by food and by lying on his right side. When he sits down he notices a dull ache on the epigastrium at a definite point under the costal margin just to the left of the midline which is very tender to pressure. He has never had nausea vomiting hematemesis or bloody or tarry stools. For 3 months he has had a burning sensation in the back at the level of the twelfth thoracic and first lumbar vertebrae not related to food or to the epigastric pain. He has been markedly constipated for years. His body weight was 164 pounds 15 years ago average 155 pounds now 140 pounds.

On physical examination the following findings were noted. The pupils were unequal and irregular but reacted normally. The abdomen was slightly full in the left hypochondrium. There was considerable tenderness 3 to 4 centimeters below the left costal margin where there was faintly palpated a firm tender mass about 3 centimeters in diameter which did not move with respiration. There was also tenderness about 2 centimeters to the left of and just between the umbilicus the pain elicited radiated to the left hypochondrium. The liver edge was palpated 4 centimeters below the costal margin and was not tender. Rectal examination was negative. Roentgenological examination of the colon was negative.

Examination of the blood showed hemoglobin 20 per cent erythrocytes 4 600 000 leucocytes 10 800 polymorphonuclears 71 per cent eosinophile 4 per cent. In the urine were found occasional hyaline granular casts occasional erythrocytes and pus cells. Gastric analysis was done on three occasions and pus cells were found on all occasions. In each analysis the free hydrochloric acid was low in one it was absent in the first five tubes (until one and one quarter hour) in another it was absent in the first six tubes (until one and one half hours) in the third it was less than three until the fourth tube. In two the total acid was low in one it was within normal limits. Notation of ferment examination was made only once in this case both pepsin and rennin were present. The stools were negative for occult blood on several examinations. Roentgenological examination on two occasions gave similar pictures. Fluoroscopic copy showed lung fields grey and apices contracted diaphragm moved very little stomach was of good tone and position peristalsis slight. Patient com-

plains of tenderness at one point of greater curvature where there seems to be some irregularity. Films showed large defect along the greater curvature. From these findings a diagnosis was made of papilloma or papillomatous carcinoma (Fig 17).

On April 20 the patient was transferred to the Surgical Service for operation. Re-operative diagnosis by Dr W. I. Terry was benign papilloma of stomach.

The patient was operated upon by Dr Wallace I. Terry on April 30 1921. Anesthetic used was nitrous oxide and oxygen. On the sero-a of the stomach on the anterior wall of the greater curvature at the junction of the upper and middle thirds were two firm glands about 0.5 centimeter in diameter. There were several moderately hard reddish glands the largest about lima bean size in the omentum. On palpation there was found an apparent mass in the stomach over the area on which the glands were seen. Gastrotomy about 3 centimeters long failed to demonstrate any polypoid condition but the mucosa was markedly thickened and thrown into heavy folds over its entire surface. The gastrotomy opening was closed in its original direction except in the lower portion which was approximated in a direction transverse to the original incision. Two glands were removed for examination. The patient stood the operation well and passed an easy convalescence. Pathological examination of the tissue showed only lymph glands in a state of hyperplasia. Patient was discharged May 15 1921 improved with the diagnosis of chronic hyperplasia gastritis.

On July 23 1921 he again reported to the Out Patient Department complaining of sharp epigastric pains in early morning. His weight was normal. The roentgenograms were again inspected by Dr. Rugles who stated that in spite of the operative findings outspoken polypoid condition undoubtedly existed and will become more characteristic in time.

The patient reported by mail in September 1923 that since the summer following his operation he has been free of any symptoms. He refused to re-enter the hospital for further study.

CASE 7. A. S. An American clerk age 41 years whose family and past history were unimportant entered the University of California Out Patient Department in January 20 3 complaining of dull pain in the abdomen and nausea. Since 1908 he has suffered from gastrointestinal disturbances. At first there was a gradual onset of fullness in the lower abdomen from 3 to 5 hours after meals changing to a dull pain starting in the right lower quadrant and radiating to the left lower quadrant associated with nausea and constipation markedly relieved by vomiting and food but aggravated by soda. He first consulted a physician in April 10. At that time he was passing tarry stools and roentgenological investigation showed evidence of penetrating duodenal ulcer. Under Sippy regime he had absolute but only temporary relief and 16 pounds weight gain. In a few months his symptoms returned and he passed bloody stools. Under dietary regime he

again was relieved, but symptoms returned whenever he went back to regular diet.

Physical examination at that time was negative except for pallor and bad oral hygiene. The urine showed pus, occasional casts, rare red blood cells, and a trace of albumin. X ray findings pointed to a duodenal ulcer. He obtained considerable relief under a Sippy regime.

He did not report again until November, 1923. During the interim (April, 1923), he was operated upon, in a condition of shock, for a suspected perforation of a peptic ulcer, but an acute perforated appendicitis with peritonitis was discovered. After his operation he was completely relieved and was placed on a regular diet until October, 1923. Then he began to have attacks of sharp pains in the left lower quadrant, always occurring at night and sometimes awakening him, associated with slight nausea and terminating after 3 to 4 hours, with an attack of vomiting of undigested food particles. Vomiting always relieved him. In the month of October, 1923, he had seven such attacks, but no bloody nor tarry stools. His appetite was good but he lost 20 pounds during that time. He was referred to the University of California Hospital for investigation, where, except for a chronic prostatitis and postoperative ventral hernia, no additional physical findings were noted. The blood was normal. The urine showed findings as on previous examination. The stool was positive for occult blood on two occasions. Gastric analysis showed free hydrochloric acid and combined acid present in slightly increased amounts. Occult blood was demonstrated in the fasting content. The blood Wassermann was negative. Vomitus was negative for blood or tumor particles. A roentgenological study of the gall bladder was negative. Gastrointestinal screen showed a stomach which did not canalize well. There was a large reticular defect of the middle of the greater curvature which seemed to be due to hypertrophied rugae. Peristalsis was excessively hyperactive. The cap was small and irregular and did not fill with pressure. The X ray findings pointed to duodenal ulcer.

On November 21, 1923, the patient was discharged with a diagnosis of duodenal ulcer, chronic prostatitis, postoperative ventral hernia and pyorrhea.

May, 1924, he again entered the University of California Hospital. After discharge in 1923 he gained weight and was comfortable on medical treatment. In February, 1924 his weight was 130 pounds and he felt below par. The night before entry he suddenly vomited about 10 ounces of old blood. He has had no tarry stools. On physical examination, gastric peristalsis was apparent through the thinned out portion of the abdominal wall, no other significant findings. The hemoglobin had fallen to 47 per cent, erythrocytes to 2,432,000. The urine still showed the slightest possible trace of albumin and a few pus cells. Occult blood was demonstrated in a specimen of tarry stool obtained by enema and in a specimen passed spontaneously 6 days later.

Two weeks of rest, diet, and medication produced no noteworthy improvement. He complained of daily epigastric pain and had attacks of vomiting. His blood picture did not improve and occult blood was constantly demonstrated in the stool. He was running a daily fever which reached about 37.5 degrees C. There was marked tenderness in the epigastrium to the right of the midline with some rigidity. On June 16, 1924, he was transfused with 500 cubic centimeters of citrated, typed blood, to which he reacted severely with chill and fever. The following day he vomited three times, each time a small amount of fluid streaked with red blood. From then on there was a steady improvement in symptoms and physical condition. His hemoglobin reached 60 per cent, red blood cells 3,400,000. The patient was transferred to the surgical service, July 6, 1924, for operation.

Preoperative diagnosis was duodenal ulcer. Operation was performed by Dr. Woolsey. Approach was made through the old scar site. There was a characteristic ulcer on the anterior superior wall of the pylorus just distal to the pyloric vein, about 3 centimeters in diameter, with a small crater palpable through the gut wall. The first portion of the duodenum was adherent to the pancreas. Because of the patient's poor condition a posterior gastroenterotomy only was done. In closing, the ventral hernia was repaired. The patient made an uneventful postoperative recovery. On July 23, 1924, his hemoglobin was up to 65 per cent and red blood cells up to 3,600,000, stool was negative for occult blood. On July 26, 1924, he was discharged and told to report to the clinic for observation.

On September 29, 1924, he again entered the University of California Hospital Surgical Service. He had felt perfectly well until 3 weeks before entry. Then he began to have a dull dragging pain in the right lower quadrant especially in the region mesad to the old right rectus scar. This pain had been present at irregular intervals, and occasionally became very acute, no relation to food, but was aggravated by activity, especially the types which cause jolting of the body. Peristaltic movements were, at times, plainly visible through the thin abdominal wall under the old right rectus incision. Blood was the same as on discharge in July, 1923. The urine was negative. On October 2, 1924, he was operated upon for repair of ventral hernia. During operation the abdomen was explored. "At a previous operation a large penetrating duodenal ulcer, that was surgically unremovable, was found with a crater extending into the head of the pancreas. At present this has entirely disappeared. There was no induration at the site of the former ulceration and the pancreas was generally firm and hardened, there was no induration at its head suggesting the presence of a crater at this time." He was discharged October 21, 1924, in good condition. Gastrointestinal X-rays on August 28, 1924, showed a large stomach functioning well. There was unusual mottling of the fundus, especially toward the greater curvature. (Thom)

The patient reported to the clinic on January 13, 1925, still complaining of gastric pain which had become constant. Abdominal X-ray studies showed that the barium dropped out of the stomach through the gastro-enterostomy opening immediately on entering; there was a point of tenderness exactly above the gastro-enterostomy opening. In the films (Fig. 18) the body of the stomach showed a marked irregularity in outline and density, due to excessive thickening of the mucous membrane of the stomach. The stomach shows no evidence of ulceration. The X-ray examination would indicate a diagnosis of diffuse polyposis of the body of the stomach (Dr. Ruggles).

In May, 1925, he complained of cramps in the region from the hernial scar to the umbilicus of 6 weeks' duration. At times the cramps were so severe that the whole abdomen was sore. The bowels moved daily. Once or twice a week he has had a sense of gas pressure accompanied by general weakness but no nausea. He has had no pain nor burning after meals. His appetite is good. He weighs 120 pounds.

In June, 1925, he still complained of distress around the hernial scar which radiates to the umbilicus.

CASE 8. W. B., a Russian male, age 41 years, consulted Dr. W. E. Chamberlain June 5, 1923, complaining of pain in the epigastrium. His family history was unimportant. He had a small lesion on his penis at 18 years, which was treated by local applications; gonorrhea in 1918. He used alcohol moderately. Otherwise there were no significant facts in his past history. In 1922 (1 year ago) he began to have gnawing pain about the umbilicus 5 to 10 minutes after meals, lasting 3 to 4 hours for periods of 1 to 2 days with remissions of 2 to 4 days. These attacks lasted about 6 months and he then enjoyed a remission for another 6 months (until January, 1923) when the pain recurred, this time sharp in character, coming on 10 to 20 minutes after meals, lasting 30 minutes to 2 hours, brought on especially by water and beverages and aggravated by meat, vegetables and fruit. The pain radiated around the left hypogastrium to the back, occasionally over the anterior chest when it was accompanied by slight dyspnea. This pain had become progressively more severe and sometimes kept him awake at nights. He has had marked anorexia but no eructations. On June 1, 1923, he passed three tarry stools, did not note character of stools before nor since. The day before this he vomited. For several years he has had dyspnea on exertion and this has become worse recently. His present weight is 174 pounds, which represents 36 pounds loss in the last 7 months.

Physical examination showed dental caries, emphysematous chest, the abdomen was markedly tender in the epigastrium and there was tenderness also at McBurney's point, no organs nor masses were palpated. No other abnormal physical findings. Examination of the blood showed hæmoglobin 85 per

cent (11) erythrocytes 5,900,000, leucocytes 7,100, eosinophiles 3 per cent on one occasion, $\frac{1}{2}$ per cent on another. Examination of the urine on one occasion showed a trace of albumin and many pus cells; on another no albumin was found. Gastric analysis May 31, 1923, showed a slight increase in mucus, free hydrochloric acid 14, total 30, occult blood trace. June 26, 1923, we found a considerable amount of mucus, some red blood cells, no free hydrochloric acid, total not higher than 8, occult blood positive in first second and fifth specimens. Sputum was negative on examination. Examination of the stool showed no occult blood nor parasites. Wassermann test on blood was negative. Roentgen ray examination was made by Dr. W. E. Chamberlain (see Fig. 19). The gall bladder films were negative of the heart and lungs, negative. Films of the stomach showed it to be in good position and tone and that it began to empty promptly. The greater curvature has a ragged appearance extending from the cardia for two thirds of its length and thus unevenness could not be smoothed out by normal pressure. Neither was it in intimate relation with the colon. Tenderness was noted over part of the uneven area. The antrum was not spastic. The duodenum was negative. In 6 hours the stomach was empty. The barium had reached the cæcum which was movable and somewhat tender. The X-ray findings would indicate the presence of gastric polyposis. The polypi may be benign or malignant. There may be chronic appendicitis.

On June 29, 1923, an unsuccessful attempt was made to gastroscopically examine the patient. Operation being considered inadvisable, he was discharged with a diagnosis of gastric polyposis.

CASE 9. H. S., an American harness maker, age 64 years, consulted Dr. W. E. Chamberlain, June 22, 1923, complaining of shortness of breath, stomach trouble and dropsy. His family history was unimportant. He had typhoid fever when 10 years old, several attacks of rheumatism in the past 10 years. He denied venereal diseases. In 1882, a lower extremity was amputated following a gunshot wound.

For 20 years he has suffered from stomach trouble. This has often been characterized by distention and dull abdominal pain. Many times, too, after meals he would have attacks of severe sharp pain across the upper abdomen, relieved by vomiting. These attacks would come about every 2 to 3 months and last 2 to 3 months. For many years he vomited nearly every day. Five years ago he vomited four to five times daily and suffered with distention and sour eructations. In 1911, for the first and only time, the vomitus contained blood, and at the same period he noted tarry stools. He has had tarry stools on several other occasions, but not in the past 6 months. He has not vomited for the past 3 years. From 1914 until 4 months ago he has been very much improved, has eaten a regular diet, has had practically no pain and very little distention. Four months ago he contracted influenza. Since then he has had aching, non-radiating

pain across the epigastrium, associated with marked distention and sour eructations coming on immediately after meals and lasting from 2 to 3 hours, no vomiting. The sensation was as if food did not pass the stomach. Appetite has never been very good. He is constipated, has had hemorrhoids for 2 years.

For the past 30 years he has had short attacks of palpitation and precordial pain. For 5 years he has noted transient oedema of the right leg and ankle (left one was amputated). For the past year he has been short of breath on exertion. Since the attack of influenza, 4 months ago, the palpitation, dyspnoea, precordial pain, and oedema have become progressively worse and associated with cough and thick yellow expectoration which has become blood streaked in the past 2 weeks. Three months ago the oedema extended to the scrotum but on rest in bed, it was much improved until 10 days ago, since when it has become steadily worse.

For many years he has had pain over the kidneys and in the urethra during micturition. Several times he has had attacks of urinary retention lasting 1 to 3 days during which he dribbled. For 20 years he suffered with nocturnal enuresis and has had to void 2 or 3 times lately he has voided 4 to 5 times at night and has had considerable day frequency. He never passed calculi.

Physical examination shows a poorly nourished, cyanotic patient with rapid respiration and slight deafness in left ear. The right pupil is slightly larger than the left, neither reacts to light but both slowly to accommodation. He has dental caries. Examination of chest by Dr Hewlett showed the backs hyperresonant except at the right base where there is a definite area of dullness accompanied by diminished breath sounds. Scattered coarse bronchial rales are heard throughout the back. Examination of the heart shows the point of maximum impulse in the fifth interspace, 1.5 centimeters outside the mid clavicular line. Just outside the point of maximum impulse and extending into the lower left axilla there are numerous sharp crackling rales on respiration, probably friction sounds. The heart sounds are clear but there are at times crackles synchronous with the heart beat, presumably a pericardio pleural friction rub. Blood pressure 150-105. Some tenderness is found over region of the left kidney. The abdomen is otherwise negative. One gains the impression of a respiratory infection and chronic nephritis. Examination of the extremities shows a moderate pitting oedema of the right foot and ankle. Amputation was done at the middle of the left thigh. Ophthalmic arteries are slightly small and tortuous. There are no other nephritic signs. The kidneys are normal. Electrocardiograph is normal. Genito urinary examination discloses no present evidence of infection in the genito urinary tract. The prostate and its secretion are normal. There is no active inflammatory or degenerative lesion present in the kidney, only hyaline casts being present which would suggest a renal arteriosclerosis or a congested kidney. (Addis)

Examination of the urine shows a heavy cloud of albumin, a few leucocytes. The phtalein output the first hour is 10 per cent, the second hour 10 per cent. Examination of the blood shows haemoglobin, 80 per cent, red blood cells, 5,120,000, white blood cells, normal. The Wassermann test gave a negative reaction. Blood urea is 36.75 milligrams per 100 cubic centimeters. The stool shows no occult blood. Gastric analysis shows some mucus, no free acid in fasting content, highest free acid 10, in second specimen, highest total 17.5 in first specimen. Roentgenograms of the chest show an old pulmonary and pleural infection, probably tuberculous. The heart is much enlarged to the right and left, suggests aortic rather than mitral disease. (Dr Newell) Fluoroscopic examination of the heart and lungs negative (Fig. 10). The stomach was not empty at beginning of fluoroscopy but was in good position and showed marked antral spasm and irritability. Peristalsis is fair. The stomach begins to empty late, but then the barium goes through the pylorus in an apparently normal manner, filling a normal duodenal cup. After 6 hours a large residue is present in stomach. The barium has reached the descending colon. The abdomen is tense and somewhat tender, so that mobility cannot be demonstrated. The caecum and ileum show nothing remarkable. After 24 hours there is still a large residue in the stomach. Only a small amount of barium remains in the colon. Re-examination after 15 hours fast, preceded by gastric lavage, shows the stomach again not quite empty but in much better condition for examination. This more satisfactory filling demonstrates some large, irregularly rounded, filling defects over the upper portion of the greater curvature. The stomach is again seen to empty normally in certain positions and at certain times. I consider the filling defects in the greater curvature typical of gastric polyposis. This may be a sarcoma. The spleen is enlarged to a moderate degree. (Newell)

On July 1, 1933, the patient refused oesophagoscopy and was discharged in fairly good condition. During the stay in the hospital, the temperature was normal.

CASE 10. Mrs J. C., a Spanish housewife age 64, entered the University of California Hospital, November 15, 1923, complaining of shortness of breath, swelling of feet and ankles, cramps in legs and rheumatism. Ten brothers and sisters died in infancy of "stomach trouble." One brother died of "tumor of brain", one uncle and one aunt died of "cancer." The patient was subject to frequent attacks of tonsillitis, had chorea at the age of 14. Otherwise her family and past history were irrelevant.

For 12 years patient has suffered from symptoms referable to her gastrointestinal system. She has been subject to frequent attacks of 'dyspepsia,' and occasional burning and slight pain in epigastrium which radiated to both scapulae. Although she desired to eat, she feared to do so because of the discomfort which it provoked. In addition to this

she had attacks of vomiting or merely nausea or eructations sometimes occurring immediately after meals, at other times several hours after. She has never had tarry stools nor diarrhoea. She has had polyuria and nocturia (7 times) for the past 3 to 4 months.

Two months ago she contracted an acute upper respiratory infection. At the onset she vomited and for the first time noted that the vomitus was blood streaked. On several occasions thereafter she had blood streaked vomitus. Two days later she noticed that her ankles which for 8 months had been the seat of mild oedema were markedly swollen up to the knee and have remained so to the present time. During the past 2 months she has had gradually increasing shortness of breath, palpitation and a non-productive cough and she has noted a feeling of weight in the epigastrium. Her best weight was 150 pounds 12 years ago; it diminished to 100 pounds 3 years ago and struck an average of about 110 pounds. She now weighs about 122 pounds.

Physical examination showed old mitral disease, marked pallor, signs of mild fibrous changes at the apex of the right lung and marked oedema of the extremities. There was a slight suggestion of a mass in the left upper quadrant of the abdomen and at one time the stomach could be easily palpated and its peristalsis observed. Rectal examination was essentially negative. Pelvic examination indicated that the patient probably had a panhysterectomy and bilateral salpingo-oophorectomy. Examination of the blood showed hæmoglobin 50 per cent (Talquist), red blood cells 2,720,000, Wassermann negative. The urine was negative. Blood chemistry within normal limits. Phthalein within normal limits. The stools were negative for occult blood and parasites. Gastric analysis showed microscopic blood in the fasting content, no free hydrochloric acid, total hydrochloric acid 15, many polymorphonuclear leucocytes. Vomitus was positive for occult blood.

Roentgen examination made by Dr. Thom on November 19, 1923, showed a marked filling defect with ragged margins involving the whole middle portion of the stomach (Fig. 1), more extensive on the greater curvature, also some involvement well up into the cardiac portion. Films showed the irregularity to involve the distal half of the greater curvature with filling defects in the cardiac and pyloric portions. From the roentgen findings gastric carcinoma was diagnosed. Five days later after the patient had been saturated with belladonna, additional examination showed during filling a large defect as of a single large mass occupying the greater part of the fundus. There was irregularity and some stenosis of the pyloric portion mostly in the greater curvature. After 6 hours there was one quarter gastric residue about half of which was in the fundus above the large mass, the rest in the prepyloric region with small irregular collections throughout. Films showed a large filling defect involving practically the whole fundus. From the

later films carcinoma of the stomach with polypoid growth was diagnosed (Dr. Thom).

On November 25, 1923, the patient vomited a piece of tissue. This was examined microscopically by Doctors G. V. Rusk and E. I. Bartlett. Sections showed a fairly orderly arrangement of gland spaces lined by a single layer of cuboidal epithelium which shows a moderate amount of metaplasia. These epithelial spaces are sometimes oval, sometimes irregular and have a tendency to form secondary pockets. The lumina are filled with mucoid material and some contain large amounts of exudate consisting of polymorphonuclear leucocytes and lymphocytes in large numbers to which in many lumina is added fresh blood in variable quantities. These gland spaces are supported by a fairly well developed connective tissue which likewise is densely infiltrated with cells similar to those found in the lumina and with fresh blood. The vessels are distended with blood. Toward the surface one finds considerable acute destructive reaction evidenced by the desquamation of the glandular epithelium, the destruction of the epithelial cellular morphology, the large amount of oedema and the large number of inflammatory cells. There is no definite evidence that this tissue is malignant although the question of invasion beyond the mucosa cannot be settled in the absence of submucosal tissue in the specimen.

The patient was then given X-ray therapy with considerable improvement. Oedema of the extremities subsided, vomiting ceased, but there was still occasional nausea. On December 9, 1923, the patient was discharged from the hospital with the diagnosis of gastric polyp with malignant degeneration with possible metastasis about the vena cava, chronic mitral valvulitis.

She reported at intervals to the Out Patient Department. In February, 1924, she passed blood for 2 days after eating meat. In March, 1924, she complained of nausea and epigastric distress. At this time additional roentgen examination showed no change. In June, 1924, the patient complained of weakness. In October, 1924, of dizzy spells which were only transient. In June, 1925, there was a gradual improvement in symptoms and physical condition. In August, 1925, the patient complained of anorexia and breathlessness. She also had pains in her lower abdomen which were irregular in onset but more constant after eating. She reported that in the early part of August she vomited blood and mucus. X-rays taken at this time suggested polyposis. Her hæmoglobin was up to 67 per cent. Her erythrocyte to 4,440,000.

In September, 1925, she complained of much discomfort in the epigastrium. She was on a diet consisting mostly of milk. The X-rays showed no change since the previous examinations. On further examination of the films, however, Dr. Ruggles feels that the well defined rounded defects separated so widely, the normal peristalsis and the lack of irregularity on the curvatures make the diagnosis of polyposis unquestionable, this being substantiated by improvement following years of X-ray therapy.

November 11, 1925, the patient entered the University of California Hospital, referred from the Out Patient Department for ascites, weakness, oedema of the extremities and return of her previous symptoms. She complained that for the past 6 months she vomited immediately after breakfast almost every morning also occasionally vomited after dinner. Vomitus was several times blood streaked and sometimes contained blood clots. She complained often of sour stomach, gas, and abdominal distress. Recently her abdomen felt "tight" and she had some tenderness in the midepigastrium referred to the small of the back, also had suffocating feeling over heart. No bloody nor tarry stools.

Physical examination showed her to be only slightly pale, not sick looking, and not having the appearance characteristic of malignancy. Her weight was 139 pounds. The conjunctivæ showed a possible slight icteric tint. There was slight dullness and diminished breath sounds at both lung bases posteriorly. Her heart is the same as on previous examination. The abdomen was distended and tense. There is a slight shifting dullness. The liver is enlarged to 12 centimeters below the costal margin in the mid clavicular line, irregular, and knob like at borders and over the anterior surface. Dr W J Kerr felt that there were possible metastases in the omentum which was rolled up over the liver, giving the nodular feel. The spleen was firm, smooth, enlarged, and was felt 4 to 5 centimeters below the costal margin. Some midepigastric tenderness was elicited. There is a pitting oedema of the lower extremities. Pelvic examination discloses the same findings as on previous examination. Rectal examination was negative.

Examination of the blood showed hæmoglobin, 64 per cent erythrocytes, 3,250,000 leucocytes, 15,600, neutrophils 78 per cent blood Wassermann was negative. Examination of urine showed slightest possible trace of albumin, no bile, urobilin, melanin nor Bence Jones protein, 3 to 10 pus cells per high dry field. Examination of the stool showed a few fine blood streaks, benzedine+, many pus cells. Gastric analysis showed fasting content neutral occult blood present, no free hydrochloric acid, total acid 10 to 20 red blood cells and white blood cells per high dry field. No Boas Oppler bacilli nor str. cane.

On November 13, 1925, she vomited. The vomitus contained many pus cells. On the same date paracentesis abdominis was performed, and 1275 cubic centimeters of greenish yellow fluid was obtained. The ascitic fluid had a specific gravity of 1.008. Albumin heavy trace. Rivalta negative. Microscopically, 3 to 5 pus cells, occasional erythrocyte per high dry field. Wassermann was 4 plus in 0.5 dilution but negative in higher dilutions. Culture showed no growth.

Roentgenograms were made of the chest and abdomen, November 12-19-25. The lungs showed increased markings which may have been due to early metastatic malignancy. The right diaphragm

was high. There was a small effusion at the right base. The liver was somewhat enlarged. On November 17, 1925, roentgenogram showed the right diaphragm high and irregular in outline with considerable change from examination 5 days ago. The liver was enlarged (Dr Ruggles).

During the stay in the hospital patient ran a daily intermittent fever to 38 degrees for the first 9 days then her temperature dropped to normal.

On November 22, 1925, she was discharged, not improved, with the diagnosis of gastro intestinal malignancy with abdominal metastases. It was by no means proven that a malignant condition existed here, and the appearance of the patient, the long duration of the disease and the lack of progression as shown by roentgenogram favor strongly the impression of benign growths, although recent malignant degeneration may have supervened.

CASE 11. E. N., a Finnish laborer, age 33 years, entered the University of California Medical Out Patient Department, April 6, 1925, complaining of abdominal pain after meals, nausea, and weakness. His family history was unimportant. Except for one attack of gonorrhea 1 year ago, his past history is irrelevant. For about 3 months, he has had epigastric distress and soreness after nearly every meal associated with gas. During this time he has had frequent attacks of nausea and headache and occasionally has vomited. He never had hæmatemesis nor bloody or tarry stools. Except for slight tenderness just above and to the right of the umbilicus his physical examination was negative.

Laboratory investigation showed normal findings in the blood and stool. The blood Wassermann was negative. Gastric analysis revealed nothing unusual, the free and combined acidities were within normal limits. The roentgenological findings of the stomach (Fig. 22) however, were extremely significant. There was a marked irregularity of the greater curvature suggesting a diffuse polyposis (Ruggles). Three weeks later, on second examination the irregularity of the greater curvature was confirmed to be characteristic of diffuse polyposis (Ruggles). This patient has improved considerably under medical treatment.

The following interesting case, Case 12, came under our care after this paper was in the hands of the printer. The history, symptoms, and X ray findings were so characteristic that in sending the report along to be included in the series we felt that this case was practically positive even though operation had not been performed and no pathological specimen obtained.

Since then this patient has been operated upon and we were confronted with an entirely unexpected condition which we find it difficult to classify.

The history of the case follows

CASE 12 E. K. A married American female nurse age 30 years consulted Dr. Bertram Frohman with the complaint of upper abdominal pain regurgitation diarrhoea headaches and dysmenorrhoea. Dr. Frohman made the diagnosis and has kindly allowed us to use his history and reports. Her family history was unimportant. In childhood she had three attacks of chorea also was subject to bilious attacks and vertigo. She had influenza twice 5 and 3 years ago. Menses have been irregular and their onset very painful. Otherwise her past history was irrelevant.

For 10 to 12 years she has had disturbances relative to her gastro intestinal system. For this long period she has been subject to indigestion gas and diarrhoea. The last has been a prominent symptom often occurring about 2 hours after meals preceded by a gripping sensation and associated with tenesmus. The stools were watery small sometimes as many as thirty in one day and occasionally bloody but never tarry. Her other symptoms were inconstant and had no definite relation to foods nor meals although she noted them more constantly after meals. In addition she has had attacks of pain in her right upper abdomen varying from a sense of fullness and pressure as of a ball under the ribs to knife like pains and also neuritic pains in the right scapular region.

Three years ago following an attack of influenza her gastro intestinal symptoms became more pronounced and were associated with dull pains in the right lower abdomen nausea regurgitation and vomiting. Gastro intestinal X rays taken at this time were negative. The symptoms were ascribed to appendiceal involvement. One year later laparotomy was performed by Dr. Waldever at Mt. Zion Hospital and a subacutely inflamed adherent appendix was removed. Exploration of the pelvis was negative except for a small uterine fibroid which was also removed. The gall bladder was normal. No mention was made of palpation of the stomach.

Following appendectomy the distention was considerably improved but she still suffered from the pain indigestion gaseous distention nausea vomiting regurgitation and diarrhoea which preceded her operation. Because of the inability to locate a definite eat for the pathological condition she was branded as a case of gastric neurosis.

Her physical examination was essentially negative except that moderate pressure just above and to the right of the umbilicus caused a desire to regurgitate. No tenderness nor abdominal masses were found.

Laboratory investigation showed normal urine. In the feces the presence of occult blood was strongly positive on two different occasions. Gastric content showed large amount of mucus no free hydrochloric acid total acidity 0 no gross blood. The blood showed a mild secondary anemia.

Roentgenological examination showed the lung fields clear heart and arch normal diaphragm moves well and equally no delay in the oesophagus or regurgitation through the cardia. The stomach is

high of good tone moves freely and peristalsis is moderate. All along the greater curvature extending from the middle third to the cardia and to a lesser degree along the lesser curvature there are multiple small finger like indentations extending into the barium mass (Fig. 23). Antrum and pylorus smooth. The duodenal cap is of medium size and smooth in outline. Descending duodenum is normal. At 6 hours there is no gastric residue. The head of the 6 hour meal is well around into the descending colon. Terminal ileum and caecum are freely movable separable and not tender. At 24 hours the colon is practically empty. An opaque enema shows that the pelvic colon fills readily and rises well out of the pelvis. The enema flows freely around to the caecum. No evidence of defects or diverticula are visible. No evidence of gall bladder shadow or stones are shown on the plain films. Cholecystography shows a normal sized gall bladder of uniform density which moves freely. From the X ray findings a diagnosis was made of diffuse polyposis (Lloyd Bryan).

Operation was performed at the Mt. Zion Hospital on May 19 1926 under local anaesthesia with 0.5 per cent novocain along with nitrous oxide and oxygen toward the end of the operation. A slightly enlarged stomach was exposed through an upper midline approach. It was free of adhesions. On palpation we were surprised to find that we could feel through the stomach wall no definite masses such as the X ray led us to believe were present especially along the greater curvature. On more careful palpation we did feel that the mucosa was thickened but remarked that in a cursory examination of the stomach any pathological condition within it would have been overlooked. A long transverse incision was made through the anterior wall of the stomach. On examination of the mucosa we were confronted with a condition which was far different from what we were led by the history laboratory and roentgenological findings to expect. There were no discrete tumors sessile or pedunculated. The exploring hand entered the stomach and grasped a handful of reddish congested mucosa which could be actually withdrawn through the gastrotomy incision (Fig. 24). On further examination it was noted that this condition was the result of a marked hypertrophy of the mucosa thrown into enormous folds of various sizes some to 9 centimeters in height higher than in any of the cases reported in the literature. The mucosa was freely movable upon the submucosa. This hypertrophy involved principally the upper and middle thirds of the greater curvature and the upper third of the lesser curvature. The pyloric third and the lower two thirds of the lesser curvature were unaffected the mucosa here being of normal appearance and consistency. There was no evidence of ulceration on the greater curvature. Two firm and purplish areas showing evidence of recent hemorrhage we feel were not produced by our manipulation. The mucosal surface was not covered by an abnormally great amount of mucus.

Between the normal and the hypertrophic mucosa there was no definite line of demarcation, but one merged gradually into the other. At operation we felt that this condition did not conform to either the polyadenoma polypeux or polyadenoma *en nappe*, but to the class of hypertrophic gastropathies, the result of chronic gastritis. Specimens were taken from this exuberant mucous membrane at different points.

When we came to close the incision of the stomach we found it impossible to do so without removing a considerable portion of the mucosa which now prolapsed out of the incision. We made no attempt, however, to remove this entire area of reduplicated mucous membrane. Patient has made an uninterupted recovery to date.

The specimen removed was examined by Dr. G. Y. Rusk of the Pathological Department of the University of California Hospital and is as follows: Microscopic examination (Figs. 25, 26, 27) of mucous membrane of the stomach shows distinct thickening, the surface epithelium is normal. The surface presents occasional shallow clefts. The glands are tortuous and lined by normal epithelium. Parietal cells are found in small numbers near the base of a few glands. Some of the glands in the deeper portion of the mucous membrane are dilated into small cysts. The muscularis mucosae forms a practically straight line. The reaction in the interstitial tissue is perhaps of relatively more importance. This consists of an oedema, somewhat more marked near the surface but extending through all the layers of the mucous membrane, dissecting the fibers of the muscularis mucosae, and into the fragments of the submucosa present in the specimen. This oedema is associated with a more or less spotty infiltration by a varying number of plasma cells, frequent eosinophiles and occasional large undifferentiated mononuclear cells. This infiltration extends in moderate degree through the muscularis mucosae. In other regions of the mucous membrane, the stroma is extensively infiltrated with focal hemorrhages. Near the areas of hemorrhage and also in the upper portions of the mucous membrane and in the submucosa, the vessels are conspicuously dilated. No evidence of fibrosis is seen. Lymphoid nodules showing no abnormality except possibly separation of the cells by the general oedema, occur at different points. Diagnosis: hypertrophic gastritis.

This case is so unusual that it deserves comment. All the clinical, laboratory, and roentgenological findings seemed to make the diagnosis definite for gastric polyposis. It is easy now to understand how the bismuth meal as it entered the stomach and passed along the various reduplications of mucosa and into the depressions between them produced the picture that it did on the X-ray plate. We will, therefore, in the future have to be ex-

tremely careful in making an absolute diagnosis of this condition from the roentgenological findings.

Pathologically Dr. Rusk believes that the best descriptive term for this condition would be hypertrophic gastritis. It may be that in time a polyposis will develop on this redundant, hypertrophied, infiltrated, and oedematous mucosa.

It is also interesting that this patient has had a persistent absence of free hydrochloric acid in spite of the fact that there was present a very excessive amount of secreting mucosa.

SUMMARY

1. Diffuse gastric polyposis is seemingly a rare disease since we have only been able to collect 84 cases from literature. However, these figures probably do not represent the true incidence of the disease.

2. Gastric polyposis may be either congenital in origin or arise from an inflammatory basis. It is of great interest that these tumors have been reproduced experimentally.

3. Gastric polyposis may appear either as distinct polyps adenomatous in nature, or as slightly elevated hypertrophic plaques *en nappe* variety. We believe that the latter may be telangiectatic in origin.

4. The symptoms and physical signs are not characteristic. Achylia is the most significant finding, combined with fresh blood and abundant mucus it should suggest the diagnosis.

5. The roentgenogram properly interpreted is the most valuable diagnostic aid. Gastroscopy and the examination of shreds from gastric washings are useful diagnostic factors.

6. Malignant degeneration occurred in 12 per cent of the 84 cases collected.

7. The treatment is surgical.

8. Our last patient, Case 12, definitely proves that the final diagnosis of gastric polyposis must be made by direct inspection at operation, that the other criteria—symptoms, laboratory findings and X-ray are not conclusive.

9. It is of interest that in our own and in the collected series no case of pernicious anemia has developed in spite of continued achlorhydria. In our series 1 case lasted 25 years.

A the	D t ep o l d	Method of diagnosis	Age of p t	Age at onset	Symptom	Phys- ical Signs	G t Anab s	V y	T est m t	C ise	Part Invol ed						D gnosis	M t gn nt d gen	Co d t	Remarks	
											Upper	Lower	Post wall	No of t	fo	Hypert or hy					Quoted by
1 R li	B fo 830	P M										+	+	+	+	+	Hypert or hy				Quoted by A d al
2 Andral	83	P M													Many		Polyad me tuppe				
3 A dral	830	P M										+	+	+	7		Hypertir phy				
4 Cru lbe	833	P M										+	+	+	40		Hypertir phy				
5 Cru lber	833	P M										+	+	+	Ma y						
6 Cru lbi	833	P M										+	+	+	1						
7 Cruv lbi	833	P M										+	+	+	95		Hypertrophy				Quoted by B ussard
8 R p lt	833	P M										+	+	+	M ny						
9 Cru albi	830	P M										+	+	+	10						Quoted by Ro- se n a G t criteria n
10 Reha d	840	P M											+	+	50						
11 Le d t	847	P M										+	+	+	150		Hypertrophy				
12 Cornel	851	P M										+	+	+	5-6						Compl t py to ic obstruc t n
13 Corn l	864	P M										+	+	+	8-10						
14 Elert n	1864	P M										+	+	+	7						
15 Elerte n	1864	P M										+	+	+	M y						
16 Elerte n	864	P M										+	+	+	M ny						
17 Elerte	864	P M										+	+	+	+						
18 Elert n	864	P M										+	+	+	+						
19 Elerte n	864	P M										+	+	+	M y						
20 Elerte n	864	P M										+	+	+	+						
21 Elerte n	864	P M										+	+	+	+						

[illegible]

1 ROULED CASES OF GASTRIC POLYPOSIS—1820-1925—Continued

Case No.	A th r	D t port d	Bl thid fd gnos s	Age w h k e P t t	Age m h e g n	Ex h i	H d i y p h p	N A	V m e	I m m s	W k e s	C t p o t i	I m o r	F e d e s	Phy cal ex	G t A n h a	V e y	T e m t	C r e	P r t i v e d						D i a g n o s i s	M t r m t d e s	L i c e n t	R m a k s
44 Ver		003 P M 15		51	F																								P l m y t b e r u l o u s
45 V		005 P M 76		1																									
46 Ve se		005 P M 33		33	M																								P l m o a y l b e f o s s
47 M n l and Cl et		007 P M 5		37 M																									
48 M l e r d Cl		007 P M 6		1																									
49 M b l		10 3 P M 58		57	F																								
50 Weg l		000 O y e 59		5	F																								T m o n t o m c h t b e
51 W i l e r 12 and Boge		9 P M 65		55	M																								A s s o c i a t e d m i l i t a r y h a m a n g o e d o b e l m a a n d m i l i t a r y l y m p h a d o m a o f t e s t e s
52 Chosroff		9 T m 36 w b t		34	M																								T m o r t e s s e s o c c a s i o n a l t u m o r b u s f i r t i m
53 M y		9 3 P M w a c h 1																											T m o r t e s s e s o c c a s i o n a l t u m o r b u s f i r t i m
54 Mead E h t		013 P M 8		8	M																								P h y s i c a n p o l y p o s i s t o o l p e t a l i s
55 M l e n g r a n u l		9 3 P M 66		66	F																								P l y m p o s i s t o o l p e t a l i s
56 St wart		0 3 P M																											A t o p h y A s s o c i a t e d w h l o

[illegible]

PROBABLE CASES

1	Brunn and Pearl	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026	1026</
---	-----------------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	--------

BIBLIOGRAPHY

- 1 ANDRAL G Treatise on Pathological Anatomy 1832
English translation from the French
- 2 ANSCHULTZ and KONJETZNY Die Geschwuelste des
Magens Deutsche Chir 1921 xlvii 264
- 3 BALFOUR D C Polyposis of the stomach Surg,
Gynec & Obst 1919 xxviii 465
- 4 BASCH S Primary benign growths of the stomach
Surg Gynec & Obst 1916 xxii 165
- 5 BLAND SUTTON J Fibroids lipomas dermoids, and
polypi of the stomach and intestine Lancet 190
ii, 5
- 6 BORMANN Das Wachstum und die Verhreitungswege
des Magencarcinoms Jena, 1901 (Quoted by
Heinz)
- 7 BRAMS W A Plaque like adenoma of the stomach
its differential diagnosis and treatment Med Clin
N Am 1924 vii, 533
- 8 BRET J Contribution a l'étude du polyadenome
polypeau et de l'adénopapilome de l'estomac
Arch gen de méd Par, 1903 1 1345-1359 Case
abstract from the original by Physicians Research
Bureau, New York City
- 9 BRISSAUD E Etude sur le polyadenome gastrique
Arch gen de méd 1885 7th ser xvi 257
- 10 BRYAN L Gastric polyposis Southwest Med, 1922
vi 223-227
- 11 CAMPBELL A M Benign tumors of the stomach
Surg Gynec & Obst, 1915 xx 66
- 12 CARMAN R D Roentgen diagnosis of diseases of the
alimentary canal Philadelphia W B Saunders &
Co 1909 2d ed 257-273
- 13 CHOSROJEFF G Ueber zwei Faelle von seltenen
Magentumoren Beitr z path Anat u allg Path
1912 liv 595
- 14 COLLIER WILLIAM Multiple polypi of the stomach
and intestine Tr Path Soc Lond, 1896 xlvii 46
- 15 CORNÉL Note sur les polypes de l'estomac Bull et
mém Soc anat de Par 1863 xxviii 582
- 16 Idem Note sur deux observations de polypes mu-
queux de l'estomac Gaz d hôp 1864, 77
- 17 CRUVEILHIER J Anatomie pathologique du corps
humain Paris, vol i 1829
- 18 Idem Traité d'anatomie pathologique, gén 1849
- 19 DESSECKER C Diagnosis of non-cancerous gastric
tumors Arch f klin Chir 1922 cxix 695-711
- 20 DOERING, H Die Polyposis intestinali u ihre Beziehung
zur carcinomatösen Degeneration Arch f klin
Chir 1907 lxxviii 194
- 21 DOUGLAS J Benign tumors of the stomach Ann
Surg 1923, lxxvii 580-586
- 22 DU BRAY E S Gastric polyposis Arch Int Med,
1920 xxvi 221-231
- 23 EBSTEIN, W Die Polypoesen Geschwuelste des
Magens Arch f Anat u Physiол 1864 p 94
- 24 ELLISON E L, and WRIGHT V M W Benign tu-
mors of the stomach Surg, Gynec & Obst, 1925,
xli 461
- 25 EUSTERMANN G P and SENTY E G Benign tumors
of stomach Surg Gynec & Obst 1922, xxxiv 5
- 26 FENWICK, S and W S Cancer and other tumors of
the stomach London 1902 p 301
- 27 FIEBIGER J Untersuchung ueber eine Nematode u s
w Ztschr f Krebsforsch 1913 xiii
- 28 Idem Cancer induced in rats by feeding with para-
sites of cockroaches Berl klin Wehnschr 1913,
I 289
- 29 Idem Animal parasites in tumor formation J Am.
M Ass 1913 ix, 1077

- 30 Idem Fortsätte Undersøgelser over Spiroptera Carcinomatos Rotten Hosp Tidsskr 1909-1910
- 31 FINING and FRIEDENWALD Gastric polyposis Am J M Sc 1911, cliv 683
- 32 GANDLER Du cancer précoce de l'estomac Di erta tion Berné 1904 (Quoted by Heinz)
- 33 GASSMAN F Zur Roentgendiagnose des Magen polypen Arch f Verdauungskr 1921 xxviii 226
- 34 GODART DANHEUX Tumeur en nappe de l'estomac Policlin 1907 xvi 54-56
- 35 HART W L Phytobezoars J Am M Ass 1923 lxxvi 18,0-1875
- 36 HAUSER G Ueber Polyposis intestinalis adenomatosa und deren Beziehung zur Krebsentwicklung Deutsche Arch f klin Med 1895, lv 429
- 37 HEINZ H Ueber Polyposis ventriculi Beitr z klin Chir 1914 xxiii 228
- 38 HIGGINS C Benign tumors of the stomach Ann Surg 1925 lxxvi 949-954
- 39 HOLMES G W Pedunculated malignant growths of the stomach Am J Roentgenol 1919 vi 29
- 40 ISHIBASHI and OHTANI Experimental production of adenoma in rabbit stomach Gann Ergebn d Krebsforsch, Tokyo 1921 xv February
- 41 ISRAEL Die ersten Anfänge des Magenkrebses Berl klin Wchnschr 1800 No 29
- 42 KALISCH D Roentgenbilder eines Magenpolypen Wien med Wchnschr 1912 lxviii 186
- 43 KALISCH Z Ein Beitrag zur Roentgendiagnose benigner Magentumoren Wien klin Wchnschr 1922 xxxv 921
- 44 LAMB D S Another case of polyposis gastrica Wash M Ann 1914 xvi 180
- 45 LEUDER Hypertrophie polypiforme de la muqueuse de l'estomac Bull et mém soc anat de Par 1841, p 206
- 46 MARFAN Troubles et Lésions gastriques dans la Phthisie pulmonaire Thèse de la n 188 112
- 47 McCULLOUGH J P Gastric polyposis and roentgen ray demonstration of same J Radiol 1923 iv 61-63
- 48 MCPHEDRAN A Multiple polyps in the stomach Canadian M Ass J 1921 xi 524
- 49 MENTRIER P Des polynômes gastriques et leurs rapports avec le cancer de l'estomac Arch de physiol norm et path 1888 Ser 1 p 32 236
- 50 MENTRIER P and CLUNET J Du polynôme gastrique à centre fibreux et de son évolution cancéreuse Bull et mém soc méd hôp de Par 1907 3d ser xxiv 449
- 51 MELENGRACHT E Ueber die Gastritis polyposa Arch f path Anat 1913 ccxiv 438
- 52 MEYER Quoted by Heinz
- 53 MICHEL H Le polynôme gastrique polypeux Montpellier 1907
- 54 MILLER T G Polypoid carcinoma of the stomach J Am M Ass 1921 lxxvi 229
- 55 MILLS G P Multiple polypi of the stomach (gastritis polyposa) with report of case Brit J Surg 1922 x 26-231
- 56 MONFALCON Polypes de l'estomac Dict d sc Méd Par 1820 xlv 227
- 57 MOORE A B Roentgenological study of benign tumors of the stomach Am J Roentgenol 1924 xi 61-66
- 58 MYER J S Polyposis gastrica (polyadenomata) J Am M Ass 1913 lvi 1960
- 59 NAPP O Ueber die Bildung polypoöser Adenome und Carcinome in atrophischer Magenschleimhaut Freiburg 1900
- 60 ORTH Lehrbuch der speciellen pathologischen Anatomie 1887 i 109
- 61 OTTO WILHELM Auswuechse im Magen durch ein Stueck Holz verursacht Neue seltene Beobachtungen zur Anat u Physiol 1824 Quoted by Watanabe
- 62 PETIT C GERMAIN R and BREYTON F La gastrite chronique hypertrophique de cheval son identité avec le polynôme en nappe de l'estomac de l'homme Bull et mém Soc anat de Par 1907 lxxvi 554
- 63 PETROW Ein Fall von multiplen Polypen im Magen und Darm mit Uebergang in Carcinoma Zentralbl f Chir 1896 p 543
- 64 PORT K Multiple Polypenbildung in Tractus intestinalis Deutsche Ztschr f Chir 1896 xli 181
- 65 RICHARD Soc Anat 1846 July
- 66 PIPALOT Estomac parsemé de tumeurs pédiculées Bull et mém Soc anat de Par 1833 p 61
- 67 RIPTER Ergänzung zur Geschwulstlehre Bonn 1907 (Quoted by Heinz)
- 68 ROCHESTER A case of three polypoid growths in the stomach of a middle aged man Buffalo M & S J 1869 viii 167
- 69 ROSENWACH and DISQUE Die Adeomatosse des Magens und ihre Beziehung zum Carcinom Arch f klin Chir 1923 ccxiv 248
- 70 ROGGEES H E Unusual gastric polyp Am J Roentgenol 1920 vii 356
- 71 SCHWABER R Diagnostische Bedeutung der Gastroskope München med Wchnschr 1922 No 15
- 72 Idem Gastroscoy in 30 cases of gastric neoplasm Arch Int Med 1923 xxiii 63-646
- 73 SKLIPOSSONSKY Gutartige papilläre Geschwulste der Magen Schleimhaut Arch f path Anat clw 1920
- 74 STEVENS J B Case of multiple polypi in the stomach Glasgow M J 1896 xlv 422-424
- 75 STEWART M J Carcinoma of the stomach in association with multiple polypoid adenomata J Path 1913 xxiii 127
- 76 STOVER W C Polypoid adenoma of the stomach Report of an interesting case Ohio State M J 1914 x 747
- 77 STRUTHERS J E Multiple polyposis of the gastrointestinal tract Surg Gynec & Obst 1914 xxviii 610-614
- 78 VERSE M Ueber die Entstehung den Bau und das Wachstum der Polypen Adenome und Carcinome des Magen Darmkanals Arb a d path Int z Leipzig Marchand I 1908 i 175
- 79 WASSINK W T Onderzoekingen naar aanleiding van de mededeelingen van Fibiger over wormgezwelken by de rat Nedel Tijdschr v Geneesk 1916 ii 2199
- 80 Idem Over wormgezwelken in de maag van de rat (Spiroptera) Nedel Tijdschr v Geneesk 1916 ii 1108-1116
- 81 WATANABE R Ueber gutartige papilläre Geschwulste der Magenschleimhaut Arch f Verdauungskr 1901 15
- 82 WISCHENSKY L Polyp und Carcinom im Magen Darmkanal Beitr z klin Chir 1910 lxx 835-909
- 83 WEGELT C Ueber Polyposis ventriculi Mitt a d Grenzgeb d Med u Chir 1900 xiv 53
- 84 WINTERITZ M C and BOGGS I R An unique coincidence of multiple subcutaneous hemangioma endothelioma multiple lymphoma endothelioma of the intestinal tract and multiple polypi of the stomach undergoing malignant changes Bull Johns Hopkins Hosp 1910 xxi 203

THE PRODUCTION OF ARTIFICIAL PLEURAL ADHESIONS

AN EXPERIMENTAL STUDY¹

RALPH BOERNE BETTMAN M.D. F.A.C.S. CHICAGO

Consulting Surgeon, Chicago Winfield Tuberculosis Sanitarium Associate Attending Surgeon Michael Reese Hospital Assistant Surgeon Northwestern Medical School

ON the presence or absence of pleural adhesions hinges the entire treatment of suppurative conditions of the lung. When a lung abscess has to be opened through an unobliterated pleura, provisions must be made to guard against the complication of open pneumothorax and a wide spread empyema. However, when adhesions have formed between the two pleural layers, the opening of a lung abscess is a simple matter and takes on the aspect of a subcutaneous abscess. Thus, it is not surprising that much work has been done in an attempt to find some simple method for the formation of pleural adhesions. That no such method has been found up to the present is the consensus of opinion of all surgeons interested in thoracic work, although innumerable methods have been advocated for this purpose. It has been the purpose of this experimental study either to find some new method of forming pleural adhesions, to revise one or any of the methods in use, or to determine which of the common methods is most satisfactory.

The methods in common use for the formation of pleural adhesions fall into four main groups. The first is effected by placing packing against the unopened parietal pleura either in the intercostal space or after a resection of one or more ribs. This method is unsatisfactory because it is uncertain, pleural adhesions resulting in some few instances. A pleural exudation often occurs. The second method consists in actually suturing the lung to the chest wall. The drawbacks of this method are that in the presence of a suppurative condition of the lung a suppurative focus is apt to be opened and a more or less localized empyema result. Furthermore, there is danger that during a violent paroxysm of coughing the patient may actually tear the lung at the site of the stitches and produce a pneumothorax. A third method consists in scarifying

the parietal or visceral pleura after a thoracotomy. This method is unsatisfactory because adhesions do not always follow this procedure, because of the danger of hemorrhage and, if the visceral pleura is scarified, because of the danger of injuring the lung with a resulting pneumothorax. The fourth and probably most satisfactory method consists in opening the chest wall and inserting a large pack between the visceral and parietal pleura. As usually practiced, this method is unsatisfactory because of the danger of an infection traveling through the external wound into the thoracic cavity or because of the likelihood of a pleural effusion due to the large amount of packing inserted into the chest wall, and also because of the danger of a pneumothorax resulting from the improper healing of the wound over the pack due to the pressure of the pack.

The experiments which we have done to establish pleural adhesions are as follows.

It was hoped that it might be possible to produce pleural adhesions by injecting into the thoracic cavity some substance which would cause sufficient irritation to bring about proliferative reaction of the pleura and the formation of adhesions. In dogs, tincture of iodine was injected into the thoracic cavity. The injection was made by means of a blunt 16 gauge needle. The needle was forced through a shaved and surgically prepared area on the chest wall into the pleural cavity. The needle was forced in slowly, overcoming the resistance of the various layers, and when finally the pleural space was entered the release of pressure against the point of the needle proclaimed this fact. In order to make absolutely certain that the pleural cavity was entered the stilette was withdrawn and an inspiratory phase watched. At inspiration we could hear the noise produced by the air as it was being sucked into the needle. A

¹ From the Department of Surgical Research, Hospital of Research and Education University of Illinois

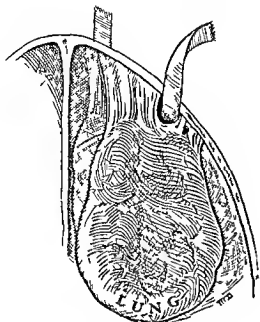


Fig. 1. Schematic drawing showing tape inserted into pleural cavity

Luer syringe was then attached to the needle and the amount of iodine desired was permitted to be aspirated into the thoracic cavity. The needle was then withdrawn and the small puncture wound sealed with collodion. In six dogs 2 cubic centimeters was injected into the chest cavity. A week later the pleural cavities were found to be free of any pleural exudate. No adhesions were present and the site of injection either could not be found at all or was marked by a very slight scarring of the pleura. When large amounts were used a severe pleurisy was set up. Many irregular adhesions string like in nature formed and in several dogs killed 3 days after injection an effusion was present. Ether alcohol and formaldehyde were injected with practically the same results except that the amount of pleural thickening produced by the formalin was markedly greater than that produced by either of the other agencies. In short no fluid which we injected in the pleural cavity produced pleural adhesions consistently.

In a series of dogs the parietal pleura was exposed by means of an intercostal incision or by rib resection. A pack of gauze was then inserted against the pleura and the muscles and skin sutured over this. Seven days later

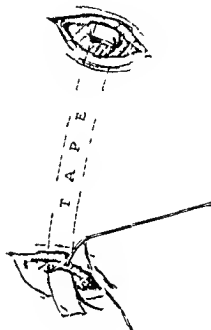


Fig. 2. Drawing showing fixation of tape to intercostal muscles

at autopsy it was found that the pleural cavity was clear, contained no fluid, and no adhesions were present. A slight pleuritis was present that is, the pleura was thicker and whiter than normal pleura with a few dilated blood vessels present. This experiment was then varied so that not only a plain gauze pack was used but an iodoform gauze pack or iodized gauze pack. The results were the same in every case. In dog 2 of this series in which the gauze pack soaked in tincture of iodine was compressed against the unopened pleura, the pack had worked its way into the pleural space and in this case firm adhesions were present. This same result was found in another dog in which on one side the pleural pack had forced its way into the pleural cavity and adhesions resulted. I was unable to obtain a pleural effusion in any case by packing against the unopened parietal pleura, except in one case in which a secondary infection ensued. In short, in dogs, packing against the unopened parietal pleura cannot be depended

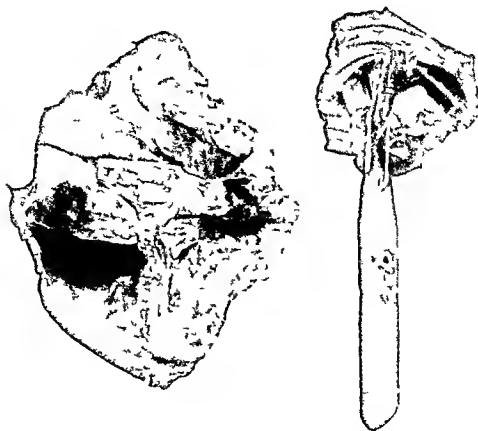


Fig 3 (left) Photograph of specimen showing pleural adhesions

Fig 4 Photograph of specimen showing an eight pound weight suspended on adhesions

upon for the formation of pleural adhesions. In my series, in no case did an external pack produce adhesions or effusion. In two instances the pack worked its way into the pleural cavity and in these cases adhesions were found.

In a series of dogs the pleura was scarified by introducing a curette through an intercostal incision and then curetting either the visceral or parietal pleura or both. In a large series of cases it was found that about one-half the animals developed fine, string like adhesions, while in the others no adhesions were present. All these animals were operated upon under the usual drop method open ether anesthesia, and no attempt was made to prevent a pneumothorax. In two dogs scarification of the pleura, in one the visceral, and in one the visceral and parietal, was carried out with an intertracheal pressure anesthesia. Great pains were taken at the end of the operation to inflate the lungs so that no pneumothorax would be present. The muscle

and skin were very carefully sutured and the wound sealed as in all the experiments with collodion. In neither of these cases did adhesions develop. I had thought that perhaps adhesions had not developed in operations done without intratracheal anesthesia because of the resultant pneumothorax and for this reason was interested in finding that, even though I took the greatest of pains to avoid a pneumothorax, scarification of the pleura did not regularly cause adhesions.

In a series of dogs a large gauze pack was inserted into the pleural space. In every one of these dogs when the chest cavity was reopened, 7 days after the operation, dense adhesions were found enveloping the gauze. Except in a case secondarily infected because of opening of the wound, no, or only a very slight, pleural effusion was present.

It then occurred to me that perhaps it might be possible to simplify this method and still produce the firm adhesions which result from a foreign body placed inside the chest

wall I took some one half inch tape as sold over the counter of a dry goods store, and carefully sterilized this with the instruments. I made a small intercostal incision through an upper and lower intercostal space. By means of a probe I threaded the tape from the upper to the lower intercostal space, sutured it carefully into the intercostal muscles, and buried it under the skin. The wounds were sealed with collodion. Open drop method ether anesthesia was used. One week later the dog was sacrificed and it was found that firm pleural adhesions enveloped the tape.

I repeated this experiment again and again and found in every case that the insertion of this thin bit of tape produced firm adhesions. At no time did a pleural effusion occur except in one case which had become badly infected because the dog had chewed open one of the thoracotomy wounds. These adhesions in some instances held the tape itself fairly well fixed. In other cases however the tape seemed to lie in a groove of adhesions and could be removed without affecting the adhesions at all. Elastic bands and silver wire introduced similarly also produced adhesions but the adhesions were not as firm or as strong as the adhesions produced by the tape. The tape could be introduced without the formation of a pneumothorax by making an oblique incision through the intercostal muscles and then using them to cover the opening into the pleural cavity. The tape was then pushed along the pleural space and a counter incision also oblique was made at the tip of the probe in the lower part of the chest. It was surprising to me to see how firmly the lung was held against the chest wall by the negative pressure and, therefore, how comparatively difficult it was to insert the tape when an attempt was made to do this without the production of a pneumothorax. As adhesions obtained by this method were no better than when a pneumothorax was produced there seemed to be no advantage in this more difficult technique. It is a well known fact that the dog will not permit of a large open pneumothorax but the openings requisite to insert the tape are so small that in no single instance was there an operative death. In several instances a large pneumo-

thorax was purposely induced and the adhesions a week later were found to be just as firm as before. The pneumothorax had been entirely absorbed. An attempt was made to find how quickly the pleural adhesions formed and for this reason dogs were killed at varying intervals of from one day to a week. Adhesions which had formed in a dog 24 hours after operation were very friable and would not withstand much pressure. The adhesions became firmer until after a week the adhesions were of sufficient strength to support all the thoracic viscera when the chest was opened at autopsy. In one instance in which the dog was killed 14 days after operation the adhesions were strong enough to support a weight of 700 grams. While in another case in which the dog was killed 19 days after operation 6 pounds were suspended from adhesions before they tore.

CONCLUSIONS

In short a method has been described which in dogs at least, produces adhesions with such consistency as to be satisfactory. This method consists of inserting a bit of tape into the pleural space and allowing it to remain there for a period of at least 7 days. This operation is extremely simple of execution and can be accomplished with the production of such a slight amount of pneumothorax that no differential pressure is required. The method has several advantages over the insertion of a large pleural pack. In the first place there is no large foreign body lying just under the wound which is apt to cause a reopening of the wound. In the second place the amount of foreign material which is buried is very slight and therefore the danger of infection and I think effusion is materially reduced. Lastly in a large percentage of cases it is possible after a period of a week to remove the foreign body without interfering with the adhesions.

TYPICAL EXPERIMENTS

I Ether anesthesia was used. A No. 16 gauge blunt needle was inserted through a small shaved and prepared skin area and pushed through an intercostal space into the pleural cavity. An inspiratory phase of respiration was observed and we heard the sound of the air being sucked into the cavity. A Luer syringe was then attached to the needle and a

cubic centimeters of iodine were aspirated into the cavity by successive inspirations. At autopsy 8 days later the pleura was clear. No effusion was found and no adhesions were present.

II November 12, 1925 a dog was anesthetized with ether by the open drop method. The pleura was exposed by means of intercostal incision on the right side. The pleura was not opened but was identified by the fact that through its transparent surface the underlying lung could be seen moving with each respiration. A gauze pad was placed against the pleura. The intercostal muscle was sutured over the pad, the skin was sutured with silk and covered with collodion. The left pleura was exposed, no pad was inserted. The muscle was sutured with catgut and the skin was sutured with silk and covered with collodion. December 1, 1925 the dog was chloroformed. An infection was found at the site of the wound and the pleural cavity was opened. No pneumothorax, no pleural effusion, and no adhesions were found. There was a slight parietal pleuritis, that is the pleura was thicker and whiter than normal and a few dilated blood vessels were seen. Paraffin section of right pleura showed pleural proliferations.

III December 8, 1925 Ether anesthesia was administered by open drop method. An intercostal incision exposed the parietal pleura. Under the exposed pleura, the lung could be seen moving with each inspiration. With a fine curved needle the lung was transfixed and sutured. On the left side an intercostal incision was made extending into the pleural cavity, and the visceral pleura was severely traumatized with a curved sharp penosteotome. Thus the parietal pleura was actually curetted from

the second rib down to the incision. The dog was killed with chloroform December 15. At postmortem examination we found on the right side no adhesions, the stitch hanging loose in the pleural space, no pleuritis, no pleurisy with effusion. On the left side there were no adhesions, no pleural effusion, the parietal pleura showed markings of trauma that is beginning scar effect, no pneumothorax.

IV December 15, 1925 A right intercostal incision was made. Ether anesthesia by the open drop method was used. Intercostal incision. Gauze pad was inserted into the chest cavity covering the area from the second to the fifth intercostal space. The dog was killed in gas chamber December 22 and we found the pad in place and some fresh blood in the pleura cavity, numerous fine adhesions which clung to the pad and which held the pleura together above and below the pad. The adhesions were not very strong and were easily torn.

VIII January 7, 1926 Ether anesthesia was used. Through a small stab wound in the upper and lower parts of the chest right and left a tape was threaded by means of a curved probe. The tape was sewed in place above and below with catgut sutures into the intercostal muscles. The tape was cut off just above the point of fixation. The skin was closed over this with silk and the wound sealed with collodion. January 26 the dog was killed with chloroform. Pleural adhesions were found on both sides. These adhesions enveloped the tape but the tape could be easily pulled out and the adhesions still preserved. A photograph was taken in which a weight well over 6 pounds was suspended from the adhesions before they tore.

FEMORAL OSTEOCHONDRITIS OF ADOLESCENTS AND SEQUELÆ

EPIPHYSEAL SEPARATION OF THE HUMERUS

BY IRVIN BALENSWEIG, B.S., M.D., NEW YORK

Instructor in Clinical Surgery, Department of Orthopedic Surgery, Cornell University Medical College; Assistant Attending Surgeon, Hospital for Ruptured and Crippled

THE ideas originally held by the author in regard to femoral osteochondritis of adolescents have not been changed nor has he been otherwise impressed by the literature that has appeared since November 1924. The literature to date has dealt with instances of moderate to marked degrees of separation of the femoral capital epiphysis. The following contains in addition to the preceding several extremely early cases in fact one might term them pre separation instances.

The extensive literature is difficult to follow as the titles are varied, some authorities write of epiphyseal fracture others of incomplete epiphyseal separation epiphyseal coxa vara traumatic coxa vara adolescent rickets pathological fracture etc. Thus we are led to believe that the etiological factor is doubtful. The various theories proposed deal with disease localized osteomalacia adolescent rickets endocrine dyscrasia and lastly traumatism. Those adhering to the traumatic theory are Royal Whitman Wilson and Davis associated with the glandular idea are the names of Hollopleau Laurent Krimisson Evans Broca and Vulliet Froelich appears to be alone in support of infection as an etiological factor.

For purposes of discussion the subject matter will be dealt with in the following sequence:

1. The capital epiphysis of the femur
2. Typical clinical and roentgen ray findings
3. Case reports (a) pre displacement stage (b) cases of very early epiphyseal separation (c) untreated cases (d) more advanced instances of epiphyseal separation treated by the manipulative method of Whitman (e) one instance of non union (f) cases treated by the open method (g) roentgen ray study of other bony regions in several of the above cases
4. Clinical resume
5. Roentgenographic resume
6. Discussion of the various theories

7. Uniform nomenclature suggested both by the literature and the author's findings

8. Conclusions

THE CAPITAL EPIPHYSIS OF THE FEMUR

Anatomists agree that the epiphysis for the head of the femur appears during the latter half of the first year of life. I Cohen takes exception to the view prevalent among authorities that ossification occurs between the ages of 18 and 20 years and gives proof that the head and neck normally unite between the ages of 15 and 16 years.

TYPICAL CLINICAL AND ROENTGEN RAY FINDINGS

They may be of the so called status lymphaticus type are found to be between the ages of 10 and 17 years and are rarely totally disabled. Questioning elicits the following that for 1 to 2 years prior to examination they have suffered occasional pain and stiffness at the hip or knee accompanied by an intermittent limp. The latter usually follows some mild traumatism. The traumatism may have been of a twisting nature a misstep a stubbing of the toes or a fall to the ground.

The symptoms may continue for months and then be either spontaneously arrested, or may progress to a stage of disability the latter most often being due to a mild injury. The last injury is usually stressed and stated to be the sole cause for the condition especially when there is a possibility of instituting legal proceedings.

The patient is observed to walk with a hip limp with the extremity externally rotated and slightly adducted or abducted. There is restriction of motion in flexion abduction and internal rotation, extension being free in the majority of cases. Here we have a diagnostic sign peculiar to this condition for in no other intra articular lesion of the hip do we find

freedom in extension. Palpation reveals a fulness in Scarpa's triangle due to the anterior twist of the neck of the femur. Mensuration discloses shortening varying from one-fourth to one half inch.

Röntgen-ray findings. During the early stages of the condition, the epiphyseal region is observed to be widened, hazy, and occasionally fragmented. The immediate diaphyseal region may present a moth-eaten appearance or reveal irregular areas of cavitation simulating the roentgenographic appearances of bone abscesses. When displacement occurs, the diagnosis is confirmed by observing the following: "Under normal conditions the head rises sharply above the upper border of the neck, in these cases the elevation is lessened and the outline of the head and neck may form an unbroken line" (R. Whitman). This may go on to complete separation of the head, the neck appearing shorter and broader due to outward rotation of the shaft, and the epiphysis flattened as a result of backward rotation. In the healed cases the changes noted are premature ossification of the epiphyseal line, increased deposition of lime salts obliterating the eroded areas, occasional diminution of the joint space due to absorption of cartilage of the femoral head and in some instances from the acetabulum, irregularity of the epiphysis, varying degrees of coxa vara due to faulty reposition of the fragments, occasional flattening and mushrooming of the femoral epiphysis simulating a healed instance of Perthes' disease, and lastly, changes indicative of osteoarthritis. Non union has been observed in one of the recorded cases.

CASE REPORTS

Group A. Pre-displacement Stage

CASE 1. R. D., age 10 years female schoolgirl was observed at the Clinic of the Hospital for the Ruptured and Crippled August 17, 1925. Patient stated that she sustained an injury to the left hip 3 weeks before and since then has been walking about with a limp but suffering no pain. She injured her hip as a result of a fall while roller skating. Further questioning elicited the statement that she has suffered occasional pain about the left hip for 1 year. This, however, has not been severe enough to warrant medical attention.

Examination reveals a normally developed child (height, 61 inches weight, 89 pounds) walking about



Fig. 1. Case 1. R. D. Diaphyseal erosion and widening of the epiphyseal line.

without assistance but with a mild left hip limp. The right anterior superior spine of the ilium is maintained higher than that of the opposite side. Movements of the left hip are partially restricted flexion being possible to 100 degrees extension to 170 degrees and abduction to 10 degrees. Rotation was not disturbed. Psoas spasm was not present. Mensuration disclosed no shortening of the lower extremities.

Röntgen ray examination on the right hip is negative for bone and joint pathology. The left hip presents a widening of the epiphyseal line more especially in its inferior half absorption of the metaphysis for a distance of one fourth inch, no evidence of displacement of the epiphysis, irregularity and increase in density of the outer third of the rim of the acetabulum.

A left hip spica plaster bandage was applied and maintained in position until October 27, 1925. Re-examination now shows the hip to be freely movable in all directions.

Röntgenogram on October 27, 1925 shows the presence of a barely perceptible displacement of the capital epiphysis. The erosion has extended one-fourth of an inch distally. The eroded area, however, has increased in density.

Plaster spica bandage reapplied October 27, 1925. On removal of the bandage January 2, 1926 a new roentgenogram was ordered. This showed no further changes. When last observed February 19, 1926 the patient had been getting about without support and suffered no ill effects. Movements of the hip were free and painless. The roentgenogram resembles that of October 1925 except that the eroded area is of greater density than the surrounding bone. This signifies healing.

CASE 2. P. R., age 12 years female schoolgirl presented herself at the clinic December 8, 1925 because of pain and limp of the left hip region. Patient states that she has been perfectly well until 3 weeks before when without cause she suffered pain of the left hip. She commenced limping a few days thereafter. Patient denies any recent or remote history of an injury or infection. Examination shows a well developed girl (weight 90 pounds height 4 feet 11 inches), walking about with a left hip limp. Movements of the hip are restricted in abduction and internal rotation all other motions are free. Extension is somewhat freer than that of the other



Fig 2



Fig 3



Fig 4

Fig 2 Case 3 H G Widening of the epiphyseal line and downward displacement of the epiphysis

Fig 3 Case 3 Normal hip

Fig 4 Case 3 Photograph of patient at the time of initial observation Clinically presents no evidence of deformity

side There is tenderness over the head of the left femur Mensuration is equal both for circumference and length Roentgenologically the right hip region is negative The left hip shows a widening of the epiphyseal line decalcification of immediate diaphyseal region for three eighths of an inch and shortening of the neck of the femur A short plaster of Paris hip spica was applied in the walking attitude and the patient advised to rest as much as was possible The above was removed January 25 1926 and the hip rayed The roentgenogram resembles that of a normal hip except for some slight widening of the epiphyseal line

Group B Cases Demonstrating Mild Epiphyseal Displacements

CASE 3 H G age 15 years male schoolboy was first observed April 1 1924 stating that he was perfectly well until 9 months ago when without cause he suffered pain along the anterior surface of the left thigh No history of infection nor of injury From

time to time he limped This would last for a few days and then disappear spontaneously

Examination reveals an overgrown boy walking about unaided without a perceptible limp Movements of the hip are free and painless The left lower extremity measures three sixteenths of an inch less than its fellow There is no atrophy present

Roentgenogram brought by patient discloses a normal right hip region The left hip shows the epiphysis flattened the epiphyseal line widened irregular decalcification of the juxta epiphyseal region presenting the appearance of fragmentation widening and shortening of the femoral neck and a mild upward displacement of the shaft of the femur The outline of the head and neck form an unbroken line

Patient refused treatment in the form of the application of a hip spica with freedom from weight bearing The Social Service Department of the Hospital for the Ruptured and Crippled reported November 1924 (16 months after onset of condition) that the patient has received no treatment since coming to the clinic and that the hip remains unchanged

CASE 4 F S age 13 years female schoolgirl was admitted to the Clinic of the Hospital for the Ruptured and Crippled July 27 1923 stating that she was perfectly well until 2 months ago when she received a slight injury to the left hip The patient was standing in a crowded train when the train stopped suddenly causing the patient to lurch suddenly forward Since then she has walked about with a left hip limp and complained of slight pain

Examination reveals a slightly overgrown girl walking about with a slight left hip limp with the limb in external rotation Both internal rotation and abduction were partially restricted Mensuration revealed one eighth inch of shortening and no atrophy

Roentgen ray examination shows the right hip region normal in all respects The left hip shows a flattened femoral head slightly displaced epiphysis widening of the epiphyseal line with absorption of



Fig 5 (left) Case 4 F S Roentgenogram of affected hip showing in addition to the widening of the epiphyseal line and softening of the juxta-epiphyseal region an area of cavitation highly suggestive of that resulting from the presence of an infection

Fig 6 Case 4 F S Roentgenogram of the same hip as in Figure 5 taken 13 months later



Fig 7



Fig 8



Fig 9



Fig 10

Fig 11

line juxta epiphyseal softening and a barely perceptible displacement of the epiphysis

Fig 11 Case 8 A H Roentgenogram of the same hip taken November 1921

lime salts for a zone of three eighths of an inch, an area of cavitation of the inferior pole of the juxta epiphyseal region surrounded by an area of increased density (resembles a bone abscess). The patient received no treatment and when last seen August 1924 she was perfectly well. Motions were free and painless. The affected extremity was one eighth of an inch shorter than its fellow. Roentgenogram of August 1924 showed the presence of premature ossification of the left epiphyseal line, uniform density of both the head and the femoral neck. The epiphyseal line on the opposite side was still in evidence.

CASE 5 V R age 13 years male schoolboy, was observed at the Cornell Clinic July 25 1921, because of pain and partial disability of the left lower extremity. The patient gave a history of an injury while playing basketball some 9 months before.

Examination shows an overgrown boy walking about with a left hip limp. Motions are restricted in all directions except extension. The left lower extremity is one half inch shorter, and the left thigh is one half inch less in circumference than that of the right. The roentgenogram presented a flattening of the head of the femur and a slight displacement of the epiphysis. The hip was immobilized in a plaster of Paris spica bandage. This was renewed from time to time. When last observed October 1924 the patient had completely recovered.

Group C Untreated Cases

CASE 6 I L age 14 years male schoolboy was admitted to the Hospital for the Ruptured and Crippled November 1921 complaining of pain and limp of the right hip region, duration 7 months. April 1 1920 while wrestling with another boy he was injured. He suffered no ill effects for 1 week. Pain and limp occurred simultaneously. Discomfort increased with motion and disappeared with rest. One month later the pain subsided sufficiently to permit of his attending school.

Examination at the time of admission revealed an overgrown boy walking about with a marked limp on the right side with the limb rotated externally. The extremity was one fourth inch shorter than its fellow and the thigh measured three fourths inch less in circumference. Flexion was restricted to 90 degrees, inward rotation and abduction were completely restricted. The roentgen ray shows a typical epiphyseal separation of but slight degree with almost complete healing at the site of displacement. The hip was manipulated under an anesthetic to increase the range of motion.

On re-examination August 1924 patient complains of pain after walking short distances. Walks with a slight right hip limp. All motions are free except abduction which is restricted one half normal, internal rotation possible to one third normal. The right lower extremity is three fourths inch shorter

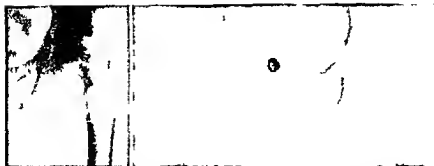


Fig 1 (left) Ca e 8 A H Roentgenogram of March 1922 several month following reduction of the separation

Fig 13 Ca e 8 A H Roentgenogram of both hips taken August 1924. The right hip region is normal. The left hip shows complete ossification of the epiphyseal line large mushroomed femoral head short and broad neck.

than its fellow the thigh presents an atrophy of 2 inches and the calf 0.5 inch

Group D. More Advanced Instances of Epiphyseal Separation Treated by Manipulation

CASE 7 M G age 15 years male schoolboy was admitted to the Cornell Clinic November 1921 complaining of pain limp and inability to separate the knees. April 1921 the patient while playing jumped over a rock (height about 6 inches) and landed on the right foot. This was immediately followed by pain and disability. He was removed to a hospital where a plaster hip spica bandage was applied and maintained in position for 9 weeks. Following the removal of the plaster he was fitted with a hip brace and told that he suffered a pathological fracture of a tuberculous joint. In June 1922 without cause he suffered pain of the left hip region. He received no treatment until the time of admission to the clinic.

Examination showed an obese young male walking about with the aid of two canes. The thighs are markedly adducted with the right knee held in front of the left. He presents a bilateral knock knee deformity with the patellae rotated outward. Both hip joints are maintained in an attitude of partial flexion. Motions are restricted in all directions. The patient was admitted to the Hospital for the Crippled and Crippled where after several forcible stretchings and an osteotomy of the right femur the deformities were corrected.

Re examination was made in November 1924. Patient can walk for short distances without assistance. The deformities remain corrected. The right hip allows of some passive motion. The left hip is practically fixed.

Roentgen ray examination was made July 1923. The right hip presents a coxa vara deformity with complete ossification of the epiphyseal line a short and broad femoral neck diminution of the interarticular joint space irregularity of the head. The left hip at the time of admission to the hospital showed the presence of a recent epiphyseal separation.

The same region now discloses incomplete ossification of the epiphyseal line irregularity of the head diminution of the joint space and capsular thickening. Roentgenograms made November 1924 reveal very little difference except for complete ossification of the left epiphyseal line.

CASE 8 A H age 13 years male schoolboy admitted to the clinic November 22 1921 complaining of a pain in left hip of 5 months duration. The onset was gradual and was not accompanied by an injury. The patient was treated for Perthes disease of the hip by the application of short plaster-of-Paris spica bandages. As the hip became worse and examination disclosed an epiphyseal separation the patient's hip was manipulated under an anesthetic and a long plaster spica applied.

On re examination in August 1924 we find that the patient walks with a slight limp and complains of pain after walking comparatively short distances. Abduction and internal rotation are moderately restricted. The affected limb is three fourths inch shorter. The thigh presents an atrophy of 1 inch.

Roentgen ray examination June 1921 shows the right hip normal for bone pathology. The left hip shows flattening of the epiphysis widening of the epiphyseal line very slight epiphyseal displacement loss of lime salts of the juxta epiphyseal region. September 1921 roentgenogram shows the above and in addition a mortising of one half of the femoral neck. In November 1921 we found absorption of part of the femoral neck with further displacement of the head on the neck. In March 1922 we found partial ossification of the epiphyseal line and deposition of lime salts in the neck of the femur. Incomplete reduction of the fragments is shown. In August 1924 we found a well formed head with flattening of the upper pole resembling the late stage in certain cases of Perthes disease of the hip short and broad neck complete ossification of the epiphyseal line.

The opposite hip is normal and shows the presence of ossification of its epiphyseal line.

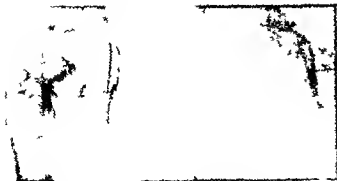


Fig. 14

Fig. 15

Fig. 14 Case 9 V C Right hip showing moderate degree of epiphyseal separation (June 8 1923)

Fig. 15 Case 9 V C Same hip as shown in previous figure Roentgenogram of August 1924 shows a satisfactory reduction of the fragments diminution of the joint space irregularity of the femoral head and premature ossification of the epiphyseal line

CASE 9 V C age 13 years female schoolgirl was admitted to the hospital in June, 1923 complaining of pain and partial disability of the right lower extremity of 9 weeks duration At the time of onset she was struck across the knee from behind and was caused to fall to the ground She was assisted home and placed in bed where she remained for 3 weeks Soon after admission to the hospital the affected hip was manipulated under an anesthetic and a long plaster spica bandage applied At the end of 10 weeks the plaster was changed, the hip being maintained in an attitude of lessened abduction Patient was discharged at the end of 5 months walking with the aid of crutches Since discharge she has been receiving physical therapy

Examination in August 1924 and in October 1925, shows that the patient is able to walk about without assistance but with a definite right hip limp She complains of no pain The hip is practically fixed in a good walking attitude The affected extremity is 1 inch shorter the thigh presents an atrophy of 2 inches and the calf of 1 inch

The roentgenograms of June 1923 show the left hip normal In the right hip region we found outward rotation and upward displacement of the shaft of the femur erosion of the proximal half of the neck marked separation of the epiphysis In December 1923 the roentgenogram shows the presence of a premature ossification of the epiphyseal line good reduction of the fragments diminution of the joint space That of August 1923 is similar in all respects to the previous picture and in addition shows some irregularity of the head of the femur, plus an outward rotation deformity of the shaft

CASE 10 M A age 12 years female schoolgirl obese and tall for age admitted to the hospital April 1923 with the following history For 3 years prior to admission she suffered occasional pain of the left hip region accompanied by an intermittent limp About 1 year later she sustained a rather mild injury causing her pain and to limp for 2 weeks Two weeks



Fig. 16

Fig. 17

Fig. 16 Case 16 T G Instance of non union at the site of separation

Fig. 17 Case 18 A Z Roentgenogram of November 1924 which was made some 16 years following an open operation for epiphyseal separation of the hip Roentgenologically the hip resembles the late stage in certain instances of Lethbridge disease

before admission to the hospital she caught her left foot in a car track and suffered a twisting injury This caused her to fall to the street She had to be assisted home At the time of her appearance at the hospital she walked awkwardly without assistance but with great difficulty The left thigh was adducted and externally rotated There was a noticeable atrophy of both thigh and calf All motions of the hip were restricted and painful Soon after entry into the hospital the affected hip was manipulated under an anesthetic and a long plaster spica bandage applied Ten weeks later the plaster was removed and a new one applied with the limb in a walking attitude Following the removal of the last plaster the patient received physical therapy She is still under treatment

Re examination was made in December 1925 Patient walks about with a noticeable hip limp Movements of the hip are partially restricted more especially internal rotation and abduction Flexion is possible to 90 degrees The affected limb is three fourths inch shorter the thigh measures 2 inches less and the calf one half inch less than that of the opposite side

Roentgen ray study A film made in April 1923 showed an upward and outward displacement of the shaft of the femur the head appeared flat Roentgenogram taken 6 months later showed a satisfactory reduction with premature ossification of the epiphyseal line diminution of the joint space erosion of the upper pole of the femoral head The films of May 1924 revealed similar findings to the previous but more exaggerated Roentgen ray of January 1925 and of August 1925 showed in addition to the above an irregularity of the acetabulum

CASE 11 R T age 11 years, female schoolgirl was admitted to the Hospital for the Ruptured and Crippled in June, 1922 complaining of difficulty in walking Two months ago the child fell from a swing landing on the right hip This was followed by pain in both the hip and knee regions accompanied by a limp Movements are but slightly



Fig 13 Case 10 M A An instance of vertebral epiphysitis associated with epiphyseal separation of the hip. The roentgenogram demonstrates irregularity of the superior and inferior borders of the mid dorsal vertebrae.

restricted abduction being limited to two thirds. The roentgenogram shows the presence of a bilateral epiphyseal separation for which an anæsthetic was administered and reduction attempted. A bilateral hip spica bandage was applied. Treatment was discontinued in January 1923 because of good recovery. The child was apparently well until July 1923 when she again fell and injured the left hip. Examination now disclosed a new separation of the left hip. This new condition was reduced under an anæsthetic and a long plaster spica bandage applied.

In response to a follow up letter in August 1924 the mother reported that the child is still wearing a plaster spica bandage on the left side. She also states that the right hip is not quite well as yet.

CASE 12 W H age 16 an overgrown boy was first seen by the author July 14 1917 at the Mary Immaculate Hospital Jamaica Long Island where he was removed in an ambulance because of pain and total disability of the left lower extremity. An hour prior to admission to the hospital he was in swimming and while making a sudden turn in the water following a dive he suffered a sudden severe pain in the left hip accompanied by the sensation of a snap. In the preceding year he had suffered an occasional pain and limp of the same hip. For the preceding 7 weeks these symptoms were more pronounced. Two unsuccessful attempts were made at reduction. The long plaster spica was then converted into a short one and the patient referred to the Hospital for the Ruptured and Crippled. The separation was finally reduced at the latter institution. Recent observation in March 1925 showed the hip to be freely movable in all directions and also painless.

CASE 13 M M age 13½ years female was admitted to the Hospital for the Ruptured and Crippled November 2 1925 because of inability to walk for the past 3 days. Patient states that she was perfectly well until 3 weeks before when she fell while at home and injured the right side. She began limping immediately. Patient is excessively tall for

her age and underweight for her height. The right lower extremity is maintained in extreme external rotation and the patient is unable to raise the extended limb from off the examining table. The affected extremity measures one half inch shorter than its fellow. Roentgenogram of the right hip shows the presence of a coxa valgus deformity with the epiphyseal line placed horizontally. The left hip presents a similar condition and in addition an upward displacement of the shaft of the femur. The femoral head appears flat the juxta epiphyseal region appears mottled.

CASE 14 R I age 11 years female was admitted to the hospital December 8 1925 because of a marked external rotation of the right lower extremity. Two years before the patient fell while roller skating injuring both hips. She recovered completely within a few days. One year ago she commenced limping on the right side and had occasional pains. The pain subsided 6 months ago but since that time she has been falling often because of the extreme outward rotation of the limb.

Examination showed patient to be of normal height and weight for her age. She walks awkwardly with a right hip limp with the limb maintained in marked external rotation. Flexion is possible to a right angle only when the extremity is externally rotated otherwise it is much less. All other motions are somewhat restricted. There is approximately one half inch of shortening.

Roentgen ray examination shows the left hip normal in all respects. The right hip presents a mottling of the entire femoral neck. The neck is short and broad. The epiphyseal line is irregular. The shaft is displaced upward and the head appears flattened. The outer half of the acetabulum is irregular.

CASE 15 R I age 12 years female admitted to the hospital October 10 1922 complaining of pain in the left knee accompanied by a limp duration 4 weeks. Examination disclosed findings typical of an epiphyseal separation. The abduction treatment was carried out and the patient gradually recovered. In March 1924 the hip was manipulated and a short plaster spica bandage applied because of some restriction of motion. The plaster was removed within a short time and on June 28 1924 the patient again returned to the hospital complaining of pain and stiffness on the left side. This resulted from a fall from a bicycle 1 month before. Examination at this time showed that flexion was possible to 140 degrees. The limb was held in external rotation and in slight abduction. Motions were restricted and painful.

The roentgenogram of October 1922 showed a slight widening of the epiphyseal line and some downward displacement of the epiphysis. That of June 1924 showed a destruction of part of the head obliteration of the epiphyseal line short and broad neck diminution of the joint space small fragment of bone separated from the upper pole of the head simulating the picture observed in osteochondritis of the knee.

Group E An Instance of Non union

CASE 16 T G, age 17 years, male, was admitted to the hospital in September 1922, complaining of pain in the left hip region of 1 month's duration. Patient states that about one year before he sustained an injury to the hip in a football game. However there was no immediate disability. Some 6 months later he began walking with a limp, this, however, did not last long.

Examination showed a tall, overgrown male walking about with a marked limp of the left lower extremity, the thigh being externally rotated and adducted. Flexion abduction and internal rotation of the hip are restricted. The affected extremity is shorter by three fourths of an inch. Two forcible manipulations were required to reduce the separation. Re examination in August, 1924, showed no improvement over the original condition. Patient became tired readily, could not dress himself completely and was unable to work.

The roentgenograms of September 1922, showed the presence of a coxa vara deformity with widening of the epiphyseal region and displacement of the shaft of the femur upward. The unaffected hip showed practically complete ossification of the epiphyseal line. Roentgenogram February, 1923, revealed a partial correction of the deformity narrowing of the joint space shortening of the neck, and softening of the diaphyseal segment. The roentgenograph of August, 1924, showed the presence of a recurrence of the deformity and in addition to the above findings an erosion of the upper pole of the acetabulum. The opposite hip remained normal in all respects.

Group F Cases Treated by the Open Method

CASE 17 L R, age 31 years, male haker returned to the clinic January 6 1925, because of pain across the lower part of the back and about the left hip. This condition had been present for many years. Due to the increasing severity of the pain he was unable to continue at his occupation. He was operated upon April 15 1908 at the Hospital for the Ruptured and Crippled, a wedge of bone being removed from the femoral neck allowing for the approximation of the fragments. The separation had been present for 1 year prior to operation. Since that time he has been getting about with a slight limp and an occasional pain.

Examination was made in January 1925. Patient walks about with a left hip limp, with the limb maintained in an attitude of flexion adduction and internal rotation. Flexion is possible to 110 degrees, extension to 165 degrees both internal and external rotation are completely restricted. Mensuration reveals a shortening of three fourths of an inch 3 inches atrophy of the thigh and one half inch atrophy of the calf.

The roentgenogram of January, 1925 showed a large mushroomed irregular head filling the entire acetabulum almost complete obliteration of the joint, a short broad neck approximation of the



Fig 19 Case 17 L R Drawing from roentgenogram showing appearance of hip 17 years following open operation for epiphyseal separation

greater trochanter and upper rim of the acetabulum (the two are separated by about three eighths of an inch).

CASE 18 A Z, age 31 years male was operated upon some 16 years ago at the Hospital for the Ruptured and Crippled for an epiphyseal separation of the left hip of 1 year's duration. He now returns because of persistent pain about the hip and knee. Patient states that he remained free from pain for a number of years following the operation.

Examination showed a well developed male of normal weight for his height walking about without assistance but with a left hip limp the limb being maintained in an attitude of flexion and external rotation. Flexion of the hip is possible to a right angle, extension to 70 degrees abduction to 10 degrees internal rotation being completely restricted. The affected limb is shorter by 1 inch presents an atrophy of 3 inches of the thigh and one half inch of the calf.

The roentgenogram of November 1924, discloses the presence of a mushroomed head short and broad neck, coxa vara deformity, but no diminution of the interarticular space. The findings are quite similar to those observed in the late stages of certain instances of Perthes disease.

GROUP G ROENTGEN RAY STUDY OF OTHER BONY REGIONS IN SEVERAL CASES

The cases studied were all recent instances of epiphyseal separation with the exception of M A. Of the entire series five patients were subjected to a roentgen ray examination of the spine, knees, and os calcis in addition to that of the hips. An additional recent case was added so that three definitely endocrine cases and three non endocrine in make up could be compared with one another. All 6 were females ranging in age from 10 to 14½ years.

Of these only two (of the endocrine type) patients, M M (Case 13) and M A (Case 10),

showed changes of the epiphyses of several of the lower dorsal vertebrae. All other epiphyseal regions examined were normal. M M presented a mild posterior (functional) curvature of the dorsal spine. M A presented clinically and radiologically an upper left dorsal curve and an accompanying lower right lumbar deviation. In addition to the above there was present a mild degree of rotation. These findings were noted about one year ago and have increased to date even though the shortening of the involved extremity was compensated for by raising the shoe.

TABLE I—CLINICAL RESUME

Case	Sex	Age, yrs.	Site	Duration	Initial	Endo type	Sh. rt. leg	End result
1	R	1	L	3 wk	Yes			
2	R	1	L	3 wk	Yes			
3	R	1	L	3 wk	Yes			
4	R	1	L	3 wk	Yes			
5	R	1	L	3 wk	Yes			
6	R	1	L	3 wk	Yes			
7	R	1	L	3 wk	Yes			
8	R	1	L	3 wk	Yes			
9	R	1	L	3 wk	Yes			
10	R	1	L	3 wk	Yes			
11	R	1	L	3 wk	Yes			
12	R	1	L	3 wk	Yes			
13	R	1	L	3 wk	Yes			
14	R	1	L	3 wk	Yes			
15	R	1	L	3 wk	Yes			
16	R	1	L	3 wk	Yes			
17	R	1	L	3 wk	Yes			
18	R	1	L	3 wk	Yes			

5 whe late
13 whe late

1 In the 18 reported cases there were 20 instances of varying degrees of epiphyseal separation.

2 Bilateral involvement was noted in 2 cases, 11 per cent at the entire series (Table I).

3 The sexes were equally affected.

4 The age at the time of initial observation varied from 10 to 17 years, the average age being 13.3 years.

5 Nine out of 18 could be classified as overgrown.

6 Fifteen hips were subjected to mild traumata, no one instance being severe enough of itself to be able to cause a fracture if the child were normal and of the same age.

7 The duration of the condition prior to the time of institution of treatment varied from 1 hour to 1½ years, the average period being about 6 months.

8 The left hip was separated in 14 instances, and the right in 6.

9 There was an end result shortening of from one eighth to 1 inch, the average being about one half inch.

10 The end results from a functional standpoint may be summarized as follows:

In Group B we have 2 excellent results out of 3 cases. In Group C we have 1 case with satisfactory result. In Group D we have 6 cases and in one patient both hips were affected making 7 hips in all in this group. In 5 hips the result was poor, in one the result was excellent and in the other satisfactory. In Group E we have one case of non union. In Group F of 2 cases one is to be classed as poor and the other as satisfactory.

In Group B we found (1) a flattened appearance of the epiphysis due to its backward rotation, (2) widening of the epiphyseal line, (3) haziness of the epiphyseal line, (4) occasional appearance of fragmentation of the epiphyseal line region (irregular islands of bone), (5) short and broad femoral neck due to outward rotation of the shaft of the femur, (6) juxta epiphyseal bone absorption, occasional cavity formation, (7) downward displacement of the femoral head or what actually takes place, an upward displacement of the shaft.

In Groups C, D, and E we found (1) early stages resembling those previously described, (2) varying degrees of displacement of the epiphysis, (3) late changes such as (a) premature ossification of the epiphyseal line, (b) occasional diminution of joint space, (c) occasional irregularity of head, (d) occasional flattening of the head resembling the late stage in some of the cases of Perthes disease, (e) short and broad neck, (f) lessening of the angle between the neck and shaft of the femur due to incomplete reposition of the fragments, (g) non union (rare), (h) occasional erosion of acetabulum, (i) capsular thickening roentgenographically shown by an increase in the density of the capsular region.

In Group F, we have the following X ray findings: (1) large irregular femoral head, (2) diminution of the joint space, (3) short and broad femoral neck, and (4) diminution of the normal angle between the neck and shaft.

DISCUSSION OF THE VARIOUS THEORIES

The rôle played by infection Studies by Froelich have tended to show that the condition is infectious in origin. Khnefelter in discussing Wilson's paper cites an instance in which removal of a section of tissue at the time of operation was later reported to be of a mildly inflammatory nature.

Several instances are recorded in individuals who are not of the overgrown type, and who have not been subjected to traumas, yet the roentgenograms of the affected hips present findings (erosion and cavitation) that are suggestive of infection.

Disorganization of the joint with the resultant symptoms simulating those of an infectious arthritis of a large joint have been observed in several of the recorded cases. In no other joint of the body that has suffered an epiphyseal separation of one of its component parts does a similar condition ensue. This latter condition holds true whether the separation is totally or partially corrected. The statement has been made that the complicating arthritides of epiphyseal displacements follow imperfect reductions. The author has cited an instance of fibrous fixation of the hip in a case with perfect reduction of the fragments. Instances of but partial reduction are quoted in which the end-results are to be considered satisfactory.

The relationship between osteochondritis juvenilis deformans and the subject under discussion is quite striking in both the early and late stages. In both conditions we are confronted by roentgenograms showing a mottling of the diaphyseal portion of the epiphyseal line, and in addition cavity formation. Short and broad femoral necks are to be observed during the course of both diseases. Years later there often results a flattening and mushrooming of the capital epiphysis. Furthermore, several instances of Perthes' disease have been shown to be infectious in origin. The author is inclined toward the infectious theory in osteochondritis juvenilis. The author also wishes to express the view that if early cases of both Perthes' disease and adolescent osteochondritis were operated upon, the presence of an inflammatory reaction in the sectioned tissues would be observed. It would

appear that both diseases arise from a common origin. Whereas Perthes' disease primarily involves the femoral head and later traverses the epiphyseal line, adolescent osteochondritis primarily affects the juxta epiphyseal region. In this latter respect it resembles osteomyelitis of other parts of the body, as the infection travels through the blood stream and localizes in the regions supplied by the terminal end arteries of the metaphysis.

Rachitis and endocrine dysfunction As rickets is a generalized disturbance, one would expect to find other epiphyseal localities affected. Such has not been our experience in 6 cases which were subjected to roentgenographic examination of other parts of the body. The above opinion is concurred in by Wilson, who also studied several cases of epiphyseal displacement. The same reasoning is to be applied to endocrine dyscrasia as a probable factor in the etiology of epiphyseal separation. Engelbach and McVahan, who have examined 2,000 cases of glandular disturbances roentgenologically, state that in uncomplicated hypothyroidism there is a retardation of development of all of the bones of the osseous system, cases of hypogonadism plus active secretion from the anterior portion of the hypophysis show a late fusion of the epiphyseal ends of the long bones and an accompanying overgrowth of the long bones. One would, therefore, expect to find changes similar to those previously described in other epiphyseal regions, yet complete roentgen-ray examination of 6 cases described in the previous records revealed no evidence of involvement of those epiphyses most subject to strain (those for the tibial tubercle or os calcis). In only two instances was there some slight evidence of disturbance of the epiphyseal regions of some of the dorsal vertebrae. Of the entire series but two patients showed involvement of both hips. Of the 18 cases 9 at most could be classified as overgrown.

In those cases classified as overgrown, the author could not discern any evidence of disturbance of the epiphyseal region of the unaffected hips. Patient T. G., age 17 years, overgrown male of the Froelich syndrome type, showed no delay in the time of ossification of the unaffected hip.



Fig 1 Illustrating stricture 15 millimeters above ureteral or with upper tract holding 200 cubic centimeters. The patient never had symptoms referable to the urinary tract until during convalescence from an acute lobar pneumonia she developed an acute staphylococcus aureus infection of the hydronephrotic kidney. Dilatation of bilateral stricture the right kidney having a capacity of 15 cubic centimeters with sterile urine. Uncomplicated pregnancy and delivery 2 years later.

A patient may have complained for years of symptoms referable to disease in one kidney and on investigation one may find on this side a kidney pelvis with practically normal outlines while on the symptomless side there is found a large hydronephrotic pelvis. Differential functional tests may reveal in one case that the symptom producing kidney is doing the better work while in the next case with apparently the same history and urographic findings the grossly dilated kidney of the symptomless side is found to have the better function.

There is no dependable relation between the patient's symptoms the size of the kidney



Fig 2 Composite photograph showing positions of kidney with patient in dorsal and sitting positions. Note the 58 cubic centimeter pelvis and lack of reflux along the catheter. After three dilatations of two stricture areas in the lower ureter there was marked improvement in the general health and thick purulent urine was changed to almost clear urine macroscopically but a colon bacillus infection persisted. One year later the patient became pregnant and in view of bilateral stricture and the best work being done by this kidney it was thought wise to give better drainage by a kidney fixation. This was done in the fourth month of pregnancy and without further treatment the urine became sterile and pregnancy continued to term without complications. There were no pathological signs about the upper ureter and this was probably a case of secondary stasis at the pelviureteral junction due to extreme mobility of the kidney and enlarged pelvis and valve-like action on the upper ureter from drag or lateral pressure.

pelvis and the functional value of the two kidneys and the only safe practice in the presence of a stricture and renal symptoms or damage on one side is to make a careful study of both sides.

In a recent study¹ of end results in 100 cases of ureteral stricture I reported finding 34 patients with a hydronephrosis content of 15 cubic centimeters or more. In 21 (62 per cent) of these the urine was sterile to culture.



Fig. 3. Illustrating ureteral stricture in the broad lumbar region, pyelitis and invalidism of 5 year duration. Rapid cessation of symptoms after dilatation of the lower stricture area. A heavy pyuria changed to macroscopically clear urine in which perished a few pus cells and a light colon bacillus infection. Repeated catheterizations showed the long narrow area above the dilated abdominal pyelitis, probably representing a stricture or perimetritis secondary to the renal infection. A large bulb near the catheter tip detects this diffuse area of narrowing. After months of dilatation of this upper area the urine became leucocyte free but still yielded a colon bacillus culture probably indicating a lack of perfect drainage.

In 2 patients with left sided hydronephroses of 140 and 360 cubic centimeters respectively the urine was negative to culture and gave no evidence of inflammation. It is this frequent finding of hydronephrosis sometimes of marked degree without any evidence of infection in the urine that strongly supports my view so much at variance with most



Fig. 4. Section of X-ray catheter inserted in pelvis to show that the bulb placed, centimeter back of the tip has passed over into the pelvis. This film was taken 3 years after the difficult task of establishing good ureteral drainage to the patient only kidney which had been operated on, times within 3 months to recurrent calculus formation. See Ureteral stricture report of unusual case illustrating influence on formation of urinary calculi and on recurrent calculi. J. Am. M. A., 1914, Section on Urology. Good drainage was established, the urine which had shown a triple infection became perfectly clear. Four times in the 3 succeeding years the patient returned with headache, constipation, anorexia and sense of fullness in the lumbar region. Each time there was put into a colon bacillus infection in the urine. Each time the patient returned weak, listless with normal urine under one dilatation, a strong demonstration of the value of good drainage. In addition to the two original strictures in the lower ureter there was inflammation and a bad zone of infection at the pelvic-ureteral region consequent on the previous infection and three operations with drainage. Note the upward deflection of the upper ureter. Note phlebotomy in broad lumbar region, probably covering former inflammation.

urologists that ureteral stricture is usually the primary lesion in the urinary tract and that the infection when present, is secondary and due to urinary stasis caused by the stricture.



Fig. 5 Each of two urograms showed the apparent kinks near the kidney. Symptoms relieved after dilatation of the stricture area in the iliac gland region. Pelvis and ureter held 13 cubic centimeters.

CHRONIC INFECTIONS OF THE KIDNEY PELVIS

The limits of space and time forbid a discussion of kidney infections in general and it is my purpose to speak only of those chronic infections seen in the daily routine of the urologist and usually classified as pyelitis infected hydronephrosis and pyonephrosis. The recent literature shows that urologists are gradually awakening to the importance of defective drainage as a factor in such infections.

Although the average acute pyelitis should be looked upon as a medical rather than a urological problem, active urological investigation should not be too long delayed if the disease tends to become chronic or if it recurs. In such cases some form of obstruction is usually present and in the vast majority of cases this will be found to be due to ureteral stricture, a condition which can be treated only by those familiar with urological methods. This rule applies to the chronic or recurring pyelitis of adults, of the pregnant and puerperal period, and in children.

I need not remind the urologists that the treatment of chronic pyelitis has presented a chapter in their activities over which they have pondered with no great enthusiasm. Formerly we rather dreaded to undertake such a case. Today with a clear understanding of the question of drainage, we welcome the problem presented by the victim of a chronic pyelitis, and in the majority of cases we can, after the preliminary investigation, give the patient a fairly accurate prognosis as to the time of recovery, and as to whether it can be brought about by simple urological methods or whether these will have to be supplemented by an operation. Years ago it was noted that a pyelitis sometimes cleared after a mere investigation with a plain catheter. Albarran in the early days advised the use of a permanent ureteral catheter for drainage, a procedure especially valuable in carrying a patient over a severe crisis and particularly useful in pregnant women in whom the abnormally high temperature occasionally seen may threaten evil consequences to both mother and fetus.

For the last 20 years there has been increasing use of pelvic lavage in these chronic infections, and not infrequently an infection of several months or years duration has been seen to disappear like magic after the first or second lavage.

Too often, however, the lavage treatment, regardless of the antiseptic used, has been a prolonged ordeal, not infrequently punctuated with a subsequent 'ureteral chill' and fever. It was the serious contemplation of this unfavorable reaction, which often left the patient with a fresh pyelitis and marked prostration, requiring a week for recovery to the previous level of normal temperature, which led me to the systematic investigation in all cases of chronic pyelitis for a possible area of infiltration in the ureter. For the past 3 or 4 years I have tentatively given up the lavage with antiseptics in the treatment of pyelitis and get far better results with drainage alone than formerly with antiseptics and the incidental drainage afforded by the use of the plain catheter.

It was this incidental drainage obtained by the passage of a plain catheter that accounted



Fig 6 Illustrating poor drainage due to enlarged pelvis and kidney mobility. Much backache and periodic Dietl's crises over a period of 20 years. After dilatation of the stricture area in the broad ligament region the patient was much relieved while in the recumbent position and had no further Dietl's crises. Walking and active housework caused considerable pain in the upper right flank for which the patient submitted to nephropexy 2½ years after the ureteral dilatation. No adhesions and no infiltration about the pelviureteral region. The periureteral veins were varicose. The pelviureteral lumen took easily an 18 Fr dilator passed down from the pelvis.

for the occasional cure of a pyelitis during the preliminary investigations of an infected kidney just as it was the trauma caused by the plain catheter that induced local oedema and a flareback in the unfortunate patient who had a stricture of too great density to be sufficiently dilated by it. The addition of irritating antiseptics that cannot readily escape when there is oedema of the stricture area and partial retention, probably does more harm than good.

Whether it will be an advantage to add the antiseptic lavage treatment after establishing partial drainage by the first one or two dilations remains to be determined by time and further observation.



Fig 7 Illustrating patient with bilateral stricture bilateral hydronephrosis calculus in left pelvis sterile urine. Note (a) ureterovesical orifice (b) stricture in broad ligament region (c) stricture at iliac gland region slightly dilated abdominal ureter right hydronephrosis of 27 cubic centimeters.

Urologists have long speculated on the cause of the mild pyelitis so often found in the other kidney. For this various factors have been held accountable—injury to the second kidney caused by compensatory overwork, high temperature and massive doses of systemic organisms incident to the disease of the kidney showing the major symptoms. Experience however offers a more logical explanation in demonstrating that stricture is practically always a bilateral disease.

In the end result study above referred to we found infection in one or both kidneys in 34 of the 100 patients. In 25 (74 per cent) this cleared up after the institution of better ureteral drainage. Of the 9 cases failing to show sterile urine after ureteral treatments in 2 nephrectomy was necessary for advanced



Fig 8 Same patient as that in Fig 1. Note catheter tip impacted against stone in left pelvis. Scratch marks on catheter tip. Note narrow pelviureteral junction a stricture probably due to irritation of the pelvic stone and to possible previous renal infection. Hydroureter is of 45 cubic centimeters. Incomplete filling of ureter but note dilated upper abdominal portion. Compare with Figure 12 taken 3 months after operation.

pyonephrosis and in the other 7 improvement in the renal drainage brought about relief of the urinary tract symptoms and enabled the patients to report after a 3 year interval that they were cured or much better in general health. This study was based on the history records and the first 100 answers to questionnaires sent to my first 300 ureteral stricture patients all of whom were treated between 1910 and 1918. It is evident that in opening a new field of work one first meets with many neglected cases and therefore with a much higher percentage of cases presenting advanced lesions and complications than is found after familiarity with the disease has enabled one to diagnose the early cases.

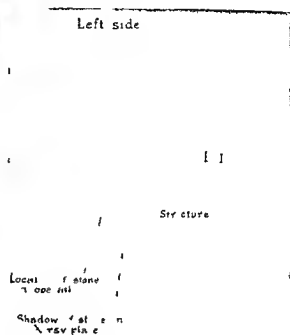


Fig 11 Illustrating change of position of stone as found at operation.

An analysis of 100 consecutive cases diagnosed as ureteral stricture between June 1 and December 1, 1919, showed that in 20 one or both kidney pelvis were infected and I think this represents fairly accurately the proportion of kidney infections due to stasis from ureteral stricture. Another 50 per cent will show in the catheterized bladder urine such evidences of a lesion in the urinary tract as a few leucocytes, a few erythrocytes, a trace of albumin or an occasional cast. In 30 per cent the urine is absolutely normal. The presence of normal or approximately normal urine in 80 per cent of ureteral strictures is one of the chief reasons why in the past so many patients with symptoms suggestive of a urinary tract lesion have been subjected to useless operations, rest cures, gastrointestinal and other forms of medical treatment when a thorough urological examination in spite of negative urinary findings might have led to a correct diagnosis and fruitful treatment.

We have seen that in our first 34 cases of chronic kidney infection we obtained a sterile urine by improving the drainage in only 74 per cent while in 7 (20 per cent) we had to be satisfied with a goal short of sterile urine and

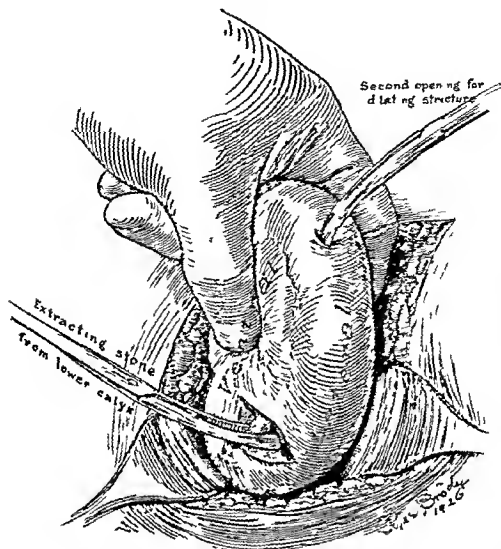


Fig. 10. At operation the pelvis was found to be of the intrarenal type (see Figure 8) and there was dense infiltration of the peripelvic fat. Two large veins traversed the posterior surface of the pelvis and the anterior surface was so densely covered by infiltrated fat that I decided to explore the kidney through a cortex opening. The curved artery forceps was plunged through the base of a pyramid and spread sufficiently to admit the index finger. The upper and middle calyces and the funnel shaped pelvis were explored, but the stone was not felt and the finger could scarcely enter the narrow neck of the lower calyx. A curved uterine sound entered the lower calyx and found the stone. A counter opening was then made through the cortex directly on the stone.

in 2 (6 per cent) nephrectomy was necessary. As has been explained this list contained a large proportion of neglected and far advanced cases and we should get far better results in dealing with patients who have the benefit of an early diagnosis. Moreover with early diagnosis and treatment of ureteral stricture we are undoubtedly preventing many potential kidney infections.

There will always be the occasional patient with ureteral stricture in whom the symptoms of hydronephrosis or pyelitis cannot be en-

tirely relieved by ureteral dilatation alone. As we have seen ureteral stricture may be an insidious disease and the patient may develop advanced kidney lesions before being aware of any illness. At times the first intimation of trouble is the sudden infection of what on investigation proves to be a very large hydro-nephrotic kidney which has undoubtedly been undergoing degenerative processes for months or years (Fig. 1).

Examples of secondary pathological conditions associated with ureteral stricture and



Fig. 11. Urogram study 3 months after operation. Note the marked downward displacement of the kidney as compared with the position shown in Figure 8. Pelvis rather smaller than before operation holding 20 cubic centimeters as compared with 45 cubic centimeters before operation. Narrow area in upper ureter but free reflux of NaI solution down to lower stricture area. Ureter is completely filled. Pelvis shadow below tip of twelfth rib. Compare Figure 8.

Criticism. Two Dakin tube were left in the upper cortex opening for postoperative irrigation because of possible bleeding. If indicated at all they should have been left in the lower cortex opening, to prevent the bending downward of the replaced kidney. At operation the kidney should always be replaced with great care and the foot of the bed should be elevated for 2 or 3 days until the kidney gets its highest fixation by adhesions. Patient free from symptoms. Urine negative to culture.

causing a persistence of hydronephrosis or symptoms of pyelitis after good drainage had been established in the original stricture site in the lower ureter are as follows. Hydro-nephrotic pelvis associated with an upper ureter which has retained a fairly fixed position may readily lead to impaired drainage by a dragging kinking or lateral compression of the pelvoureteral region (Fig. 2). This condition is exaggerated if the naturally narrow upper ureteral segment is the seat of infiltration due to the chronic inflammation some times present in the sterile and more often in the infected cases.



Fig. 12. Illustrating stone particles left in lower calyx after pyelolithotomy for a large mucocalcareous mass with colon bacillus infection. Postoperative lumbar drainage and lavage for 3 weeks. At the end of 5 weeks the urine was negative on microscopic and culture tests in spite of the small stone particles in the lower calyx. Preliminary dilatation of bilateral ureteral stricture. A complete examination at the end of 1 year revealed the same stone particles, normal urine and freedom from symptoms.

The upper ureter may be suspended, kinked or laterally compressed by the adhesions or bands of a periureteritis or perinephritis consequent upon a pyelitis, an infected hydro-nephrosis, an infected nephrolithiasis or a former operation.

The pelvoureteral channel may preserve its original normal axis but the drainage be seriously hampered by narrowing of the upper lumen due to an actual chronic infiltration of the ureteral walls, in other words by a local ureteral stricture of the upper segment (Fig. 3). I rarely see a stricture in the upper ureter to which I ascribe the same etiology as to those occurring so frequently in the lower ureter. If the roentgenogram reveals a calcified gland near the stricture in the upper ureter this points strongly to an origin from some focal infection such as is usually the cause of stricture of the lower ureter but I

believe that most of the infiltrations found in the upper ureter can be ascribed to an extension of the inflammation from an infected pelvis, whether associated with an infected hydronephrosis, a pyelitis, a pyonephrosis, or a nephrolithiasis.

The point of great practical interest in cases with high stricture, when uncomplicated by an abnormal angle of insertion, is that in these good drainage can be secured by urological methods and without operation. The technique is slightly more difficult and requires greater care than for the lower strictures. The wax bulb must be placed within 2 or 3 centimeters of the catheter tip and the wire stylet, if used, must be partly withdrawn to give the catheter tip a flexibility that will favor its deflection by the kidney pelvis and thus prevent perforation.

With sufficient experience one can feel the bulb pass through the upper stricture and over into the kidney pelvis, and one can more easily detect the hang of the bulb coming out, and can accurately measure the distance from this area of resistance to the external urethral meatus. As a check on this method one can use a radiograph catheter and with a pyelo-ureterogram can determine whether the terminal 3 centimeters of the catheter carrying the bulb has actually passed into the pelvis (Fig. 4).

If it is not possible to dilate the upper stricture by the vesical route, an operation to expose the kidney pelvis and dilate by the retrograde route is indicated on the same principle that one has occasionally to apply in treating a stricture low in the ureter through an extraperitoneal exposure.

The pyelo ureterogram is our greatest help in a study to determine whether a given case of hydronephrosis or pyelitis is going to be cured by urological methods alone or whether operation will be required. It must be remembered, however, that urograms, like a gastro intestinal series of films, may be quite misleading, and the man who studies them most carefully, and in the light of all available knowledge, is the one least willing to make a positive diagnosis on the urogram alone. Operations are being done daily because of such misinterpretations, whereas a thorough

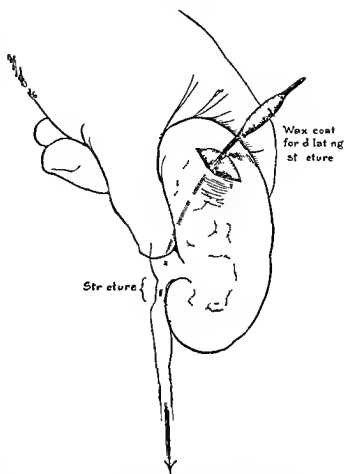


Fig. 13 After removal of the stone an attempt was made to dilate the narrow pelvi ureteral junction. The uterine sound, a fine silver probe, a pointed renal catheter and a fine pointed dilating bougie each failed to enter the ureter. Fortunately we had introduced a catheter from below before beginning the operation for the purpose of studying the reno ureteral relations by injection of methylene blue salt solution. An assistant now reintroduced a wire stylet and pushed the catheter up through the pelvis and out of the upper cortex opening. I built up a large wax bulb, 5 millimeters in diameter near the catheter tip and the assistant withdrew this through the bladder.

investigation would have led to a correct diagnosis and a more rational and often a less radical line of treatment. This statement applies with particular force in the field under discussion. If ureteral stricture is the chief etiological factor in poor urinary drainage and in most cases of hydronephrosis and chronic renal infection, it is evident that our past methods of dealing directly with the renal disease and overlooking its most frequent cause have been woefully defective.

Thorough investigation will make it clear that in many cases the defective drainage is due to stricture in the lower ureter, although

the urogram shows apparent secondary pathological changes in the kidney region, and may lead one to predict eventual operation as necessary. It is surprising in how many of these instances a few ureteral dilatations may suffice to produce perfect drainage as indicated by the disappearance of symptoms, clearing up of the infection and marked increase in renal function (Fig 5).

In others the ureteral stricture dilatation may yield only fair amelioration of symptoms and we are forced to accept the urogram indications and operate to clear up the secondary pathological conditions in the renal or upper ureteral region. But even in this group our preliminary ureteral dilatations will usually have placed the patient in much better condition for operation and have greatly enhanced the ultimate success of the operation (Fig 6).

In a third very small group we apparently make no progress by thorough dilatation of the lower strictures because the secondary conditions about the kidney have become so advanced that the interference with drainage is now located almost entirely in this region. Nephrectomy is often indicated in this group, and if the kidney is worth saving by conservative operation we have often advanced the success of this by preliminary dilatation. Inasmuch as stricture is practically always bilateral we have helped most in this group by deferring operation until the better side has been improved by drainage.

URINARY CALCULUS

In the past 10 years I have studied the relationship of ureteral stricture to calculus formation in more than 200 cases of renal and ureteral calculi and have found that the two conditions are associated in considerably more than 90 per cent of the cases.

We must admit at once that an infected calculus kidney is prone to cause inflammation of the walls and of the surrounding tissues of the upper ureter. We must also admit that a calculus forming in the kidney and becoming wedged in any portion of the ureter may set up local inflammatory reaction and thus become encased in a scar tissue or stricture area.

Careful study of the subject, however, has convinced me that in most cases of urinary calculus in the upper tract, ureteral stricture is the primary lesion and calculus formation is a secondary process due in large measure to impaired drainage.

We find calculus formation in only about one twelfth of all our stricture cases, a strong indication that factors other than stricture and stasis play an important part in stone formation. While stricture is practically always bilateral, and while I have claimed that this fact probably accounts for the relative frequency of bilateral calculus, yet the incidence of bilateral calculus is not nearly as high as we would anticipate if we attempt to discard other factors as having an important rôle in stone formation. Clinical experience in this field has led to the following conclusions: (a) "The presence of a calculus in the kidney or ureter is presumptive evidence of a co-existent ureteral stricture," (b) ureteral stricture is probably of blood borne origin, hence, as one would anticipate under such circumstances we find that it is practically always bilateral, (c) the symptoms and many of the pathological changes which we formerly ascribed to the presence of a stone are probably more often the result of stasis due to the stricture. If these conclusions are verified by the work of others as the current literature on the subject seems to promise we shall have the key to many of the problems associated with calculus that have puzzled urologists and medical men in general, and we shall have revolutionized our attitude toward the therapeutics of renal and ureteral calculus.

Instead of looking upon the presence of a calculus as a purely surgical problem we shall realize that we are dealing with an intricate problem of drainage one which affects not only the side harboring the calculus but the opposite side as well and that back of this problem of bilateral ureteral drainage we usually have the problem of a focal infection.

By early diagnosis and treatment of ureteral stricture, including the eradication of the causative focal infection we shall greatly reduce the incidence of stone formation.

*Radiographic evidence of the association of ureteral stricture and urinary calc. *A. J. Urol.* 1915 xiii 497.

In nephrolithiasis and ureterolithiasis operations the intelligent management of the drainage problems before, during, and after operation will provide our best insurance against the recurrence of stone on the side operated upon, and against the future development of stone on the opposite side (Figs 7 to 11)

Every surgeon experienced in renal calculus work knows how we have dreaded the establishment of lumbar drainage because of the dangers of persistent fistula, infection by extraneous organisms, and consequent recurrence of calculus formation. Rovsing¹ has emphasized these dangers and even goes so far as to advise "nephrectomy in cases of unilateral infection with urea decomposing micro organisms, and in other cases of pyonephrosis in which drainage of the pyonephrosis cannot be avoided." He presents the following table of nephrolithotomies

	Cases	Recurrences	Per cent
Total number	109	44	40.36
Aseptic cases	58	15	25.86
Infected with bacillus coli	27	10	37.03
Infected with urea decomposing microbes (staphylococci proteus hauseri)	24	19	79.16

With the control of drainage made possible through ureteral stricture work we now deliberately establish free lumbar drainage in (a) any case in which we suspect that our pre operative dilatations have not been adequate, (b) any case in which we suspect small particles of stone have been left, and (c) any case in which we fear blood clots may remain

In the first group we attempt to keep the lumbar drain in place for weeks, if necessary, until we can make certain of adequate post operative ureteral dilatation through the vesical route. Experience has shown that as soon as we establish good ureteral drainage the lumbar fistula closes promptly, and most of these patients are dismissed with clear urine free from organisms and pus cells, even in cases still carrying a foreign body in the kidney in the form of minute stone particles which we have missed at operation (Fig 12)

ESSENTIAL HÆMATURIA

Until the publication 3 years ago of my paper entitled "Ureteral Stricture, An Important Etiological Factor in the So-called Essential Hæmaturias," the profession had universally adopted the viewpoint expressed by Israel 20 years previously that these hæmaturias are due to organic changes in the kidney substance. In subscribing to this view I added the newly discovered fact that these nephritis changes are associated with ureteral stricture. I held that the chronic changes in the kidney are usually secondary to the stasis caused by the stricture, and that in some instances the kidney lesion is probably due to the same hæmatogenous infection that has caused the stricture. That the bleeding usually represents injury caused by the back pressure is shown by the large percentage of "cures" obtained by the one therapeutic measure of restoring good drainage by dilatation of the ureteral stricture. That repeated direct injury to the kidney substance by toxins coming from a focal infection may be the chief cause of the bleeding in some instances is suggested by the fact that a few of these patients continue to bleed after thorough dilatation of the stricture and until an area of focal infection has been found and removed.

I reported 18 cases with 25 bleeding kidneys (7 of the patients showing bilateral hæmaturia) in which restoration of good drainage and treatment of the areas of focal infection had given far better results than we had before attained by methods which often involved operative procedures. In the past 3 years I have treated about as many more such patients with excellent results, and the literature shows that others are doing likewise.

CONGENITAL MALFORMATIONS

With the development of renal catheterization, congenital malformations of the upper urinary tract, formerly diagnosed only at operation or autopsy, are now known to be far less rare than was supposed.

Because of the comparative frequency with which these malformations are now discovered when a search is being made for the cause of renal symptoms, it is generally stated that the

¹Secondo Congr. della Società internaz. di urol. Roma, 1924. April 24-26

malformation, when present, predisposes to such diseases as hydronephrosis, pyelitis, pyonephrosis and calculus.

My experience with about 30 of these cases in patients with congenital malformations shows that the condition is nearly always associated with ureteral stricture, and it is only reasonable to suppose that the stricture with its impeded drainage rather than the malformation *per se* is the cause of the secondary disease.

These patients with congenital malformations and secondary lesions in the kidney should have the same treatment as those with a normally formed kidney which has become diseased because of the stasis due to stricture—the establishment of thorough drainage.

MULTIPLE ABORTIONS DUE TO RENAL INSUFFICIENCY

In a recent publication¹ attention was called to that important group of cases in which the woman is unable to carry a fetus to term apparently because of renal insufficiency, and to the fact that in many of these cases bilateral ureteral stricture is found, as associated sometimes with serious renal disease.

I reported 3 cases apparently belonging to this group in which after the establishment of good ureteral drainage, the general health

and renal function improved so much that the women were able to go to term and were delivered of healthy children.

MEDICAL NEPHRITIS

Just what part defective drainage may have in the renal diseases usually considered as purely medical offers a fertile field for future research.

Until urologists come to a better understanding of the frequency of ureteral stricture and its significance in the renal diseases usually considered surgical they cannot expect internists to co-operate in determining whether stricture with its impaired drainage is a source of a certain number of cases of chronic nephritis formerly considered amenable to medical measures only.

From experience with many patients showing a clinical picture most suggestive of what is usually considered an indication of a more or less hopeless chronic nephritis, I am confident that in the future our first concern in these cases will be to see whether the kidneys are having good drainage.

We do the average patient no harm in the investigation for the possible presence of ureteral stricture, and if stricture is found it does not seem unreasonable to state that the establishment of better drainage is the first and most important step in the expectant treatment.

¹Ureteral stricture in obstetrics with special reference to multiple abortions (renal) and to pyelitis of pregnancy. *Am. J. Obst. & Gynec.* 1925 ix 47.

THE TREATMENT OF PYLEPHLEBITIS OF APPENDICULAR ORIGIN

WITH A REPORT OF THREE CASES OF LIGATION OF THE PORTAL VEIN

BY RALPH COLP, M.D. F.A.C.S. NEW YORK

From the surgical service of Dr. Edwin Beer, Mt. Sinai Hospital, New York

THE dreaded complication of suppurative pylephlebitis occurring in acute appendicitis is now rare because the great majority of cases are operated upon earlier and with better surgical technique than they were formerly, yet it occasionally occurs, and its proper treatment is still a mooted question. When Fitz (10), in 1886, tabulated his autopsy findings in patients dying from acute appendicitis, pylephlebitis was not an unusual complication, occurring 11 times in 257 cases. Armstrong (1), in 1897, found postmortem pylephlebitis and abscess of the liver in more than 5 per cent of 546 examinations made of patients dying of appendicitis. In Gerster's (12) experience, based on his observations of 1,189 cases in which an operation had been done for acute appendicitis, at the Mt. Sinai Hospital, New York, from 1892 to 1901, this complication occurred 9 times. More recently Braun (Zwickau, 4), reported it as occurring 8 times in 600 cases, A. and E. Moschowitz (19) 7 times in 1,529 cases, and Giertz (13), 4 times in 533 cases. From 1916 to 1925 there were 2,841 patients with acute appendicitis admitted to the surgical wards of the Mt. Sinai Hospital, New York, and in this number the diagnosis of appendicular pylephlebitis was made in 9 cases, about three tenths of 1 per cent.

The pathology of this untoward complication is variable and inconstant and because of this the treatment is unsatisfactory. As a rule, the appendix is acutely inflamed red and turgid, often gangrenous and commonly complicated by abscess. The smaller venous radicles of the mesenterium are usually thrombotic, and the thrombi may contain bacteria (26). Cases have been reported in which the appendix appeared grossly normal, and Bier (4) cites an interesting case in which at autopsy the portal vein contained a thrombus loaded with streptococci, while the appendix showed but a mild infiltration with

the same organism. In some instances, these infected thrombi may shoot bacterial emboli into the liver, forming multiple metastatic abscesses while the portal vein and its tributaries remain normal. More commonly, there is a direct extension of the infected clot into the ileocolic vein and hence into the larger venous channels, finally gaining the intra-lobular veins of the liver, about which abscesses containing greenish yellow pus are formed. The right lobe is more commonly involved. In some cases, the thrombophlebitis remains localized in the ileocolic vein which may be felt retroperitoneally as a firm, hard strand often reaching the diameter of the little finger, occasionally, the inflammation spreads beyond the vessel wall, forming a perivenous abscess, or a retroperitoneal phlegmon. But the portal vein is not the only path by which infection may enter the liver. The lymphatics of the portal fissure and the retrocecal and retrocolonic spaces, and extension of suppuration in the subhepatic or subphrenic spaces may be responsible also for hepatic abscesses.

The pathological picture of the portal vein varies. Externally it may appear almost normal except for a slight edema (Case 3) or there may be a definite enlargement with congestion and engorgement, the inflammatory products extending between the layers of the gastrohepatic omentum and into the adjacent lymph nodes matting the structures to such a degree that isolation of the portal vein may be extremely difficult (Cases 1 and 2). The lumen of the vessel may be filled with a friable sanguinopurulent clot which may autolyze into a dirty looking, greenish yellow viscid material partly or completely obstructing the vein. In rarer instances, the vein wall shows purulent infiltration, and it may even be bathed in pus.

Pylephlebitis complicating acute appendicitis may be present at the time of operation

or subsequently develop within 24 hours, or as late as 43 days after. The onset is ushered in, as a rule, by a severe shaking chill and a rise of temperature to 104 or 105 degrees. These chills may then recur daily. Gerster (12) states: "Chills accompanied by a rapid rise in temperature during the course of an appendicitis, however mild as to local symptoms, may and usually do signify the entrance of a septic material into the portal and general circulation. It must be looked upon as a sign of gravest importance." Jaundice may be present, and in many instances before the icterus is apparent clinically the bilirubin content of the blood serum may show a progressive increase (Case 3). The abdomen on physical examination may be soft and relaxed throughout with the local condition subsiding or even healed, while the liver, which may be tender to percussion, is often felt enlarged. Blood cultures as a rule are negative, because according to Lenhartz (17), the bacillus coli which is usually responsible, either rarely breaks into the blood stream in these cases or if it does it is quickly destroyed there or in the liver. In other cases, early cultures of the blood may show a growth and Lewis and Rosenow (18) have demonstrated clinically and experimentally what an important part infection plays in the production of pylephlebitis.

Most surgeons consider the prognosis of portal suppuration as invariably fatal. While the ultimate outlook is bad it is not absolutely hopeless. There are patients with mild infection who undoubtedly get well (2 and 9). Petren (21) was able to collect more than 20 histories of patients with liver abscess following appendicitis who recovered by operation and the literature contains several reports of hepatic suppuration which resolved spontaneously. But since in a series of 1,340 autopsies (21) following acute appendicitis liver abscess was partially responsible for 5 per cent of all deaths the question naturally arises whether any treatment can reduce the incidence of this unpleasant complication.

It is universally granted that if all patients suffering from acute appendicitis were operated upon within the first 24 hours, this complication might never occur. Unfortunately,

this desideratum is not always obtainable. It has been taught that a history of chill should excite suspicion of a possible pylephlebitis. Thalhimer (26) states: "Every case of acute appendicitis should be considered as an early case of potential pylephlebitis whether there is a history of chills or not. Consequently, the appendix and its neighborhood should always be carefully inspected for the presence of small thrombosed veins so that these can be dealt with." However, there are innumerable cases giving a history of chills in which operation discloses an acutely inflamed, gangrenous appendix with an oedematous mesentery often containing definitely thrombosed veins which, following appendicectomy, make an uneventful recovery. (A review of these cases will be published later.) In fact, Sonnenburg (23) believes that thrombotic veins are present in all acutely and chronically inflamed appendices. There are probably two reasons why pylephlebitis does not occur more frequently. One is the early ablation of the appendix as the primary bacterial focus, the other that the liver cells are capable of destroying a certain number of bacterial emboli. The real danger in pylephlebitis is not the suppurative thrombophlebitis *per se*, but the destruction of liver tissue by abscess formation to such an extent that death results from either sepsis or cholæmia. Therefore, any treatment instituted must be directed to safeguard the liver from vascular infection by occluding the veins carrying these organisms.

The indications for surgical therapy may be divided into the prophylactic, the treatment of frank phlebitis present at the time of operation and a treatment of pylephlebitis manifesting itself after the operation.

It is very difficult to decide what should be done prophylactically if the mesentery of a gangrenous appendix does not bleed when cut because of thrombus formation. It must be granted academically that some cases with chills and friable thrombotic mesenteries will develop pylephlebitis. Yet the percentage is so exceedingly small (in our series of 2,703 cases less than three tenths of 1 per cent) that actual damage rather than help might result from the various surgical measures

which have been advocated to deal with these infected thrombi. If, however, the case presents all the clinical symptoms of pylephlebitis, or at operation a suppurative phlebitis of the mesentery is evident, then a venous excision or ligation is certainly indicated, done preferably before the appendectomy. Various surgical procedures have been advocated. Gerster (12) practiced incision and drainage of the infected thrombosed veins, Wilms (29) advised excision of the veins of the ileocecal angle. Braun (5) recommended the ligation of the ileocolic vein, and Neuhof (20) suggested the occlusion of the portal.

Gerster (12), in 1903, discussing the treatment of pylephlebitis, stated "When much necrosis is found it would be very desirable to expose and evacuate thrombosed veins. On account of their anatomical relations this is sometimes easy, oftener difficult and mostly impossible." And, in support of this statement, the following two cases are not without interest.

CASE 13 Perforated empyema of appendix, purulent thrombosis of vessels of appendix and neighboring cæcum, appendectomy, removal of mesenterium, incision and drainage of thrombosed veins, cured.

Isaac G., age 27 years, a presser, had never been ill until the present time. Thirty-six hours before admission he began to suffer with severe abdominal cramps, vomited repeatedly, was chilly at the onset. During his transportation to the hospital the abdominal pain subsided very materially. On admission, December 9, he looked very sick. His internal organs were normal, the abdomen was rigid and tender all over, but especially so in the right iliac fossa free fluid in both flanks. Rectally, a tender area high up on the right side could be palpated, temperature 104 degrees F, pulse rate 82. Diagnosis acute appendicitis peritonitis. Immediate laparotomy was done, free exudate was found in the peritoneal cavity, there was a localized thick, tenacious, but odorless encapsulated exudate in the right iliac fossa below and external to the caput coli. The appendix was found internal and below the caput coli curled up in a semicircle. It was perforated, and from the hole, brownish pus exuded. The mesenterium was infiltrated with pus and the purulent infiltration extended up to the adjoining vessels of the cæcum. The appendix with its mesenterium was ligated and removed. The purulent veins of the caput were incised, curetted, and drained. During this part of the manipulation the cæcum was punctured and at once closed by

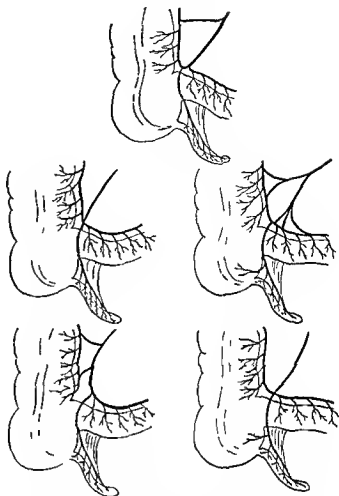


Fig. 1. Variations in the venous supply of the ileocecal angle. (After Walcher.)

Lembert sutures. Drainage of stump of mesenterium, appendix, and cecal region, closure of the rest of the wound. The temperature fell after operation to 100 degrees F and then rose to 102.2 degrees F and continued for the next 10 days between 100 degrees and 101 degrees F. There was a profuse purulent discharge from the drainage opening for a week, thereafter rapid closure of the wound. The convalescence was interrupted by a rather severe attack of tonsillitis. Discharged cured, February 2, 1902.

CASE 14 Acute gangrenous appendicitis, thrombosis of veins of mesenterium of appendix and adjoining veins of cæcum, appendectomy, drainage of thrombosed veins, cured.

J. G. age 24 years, a canvasser, was never sick until 36 hours before his admission. During the first 12 hours he felt chilly at intervals and suffered with pains in the right iliac fossa. During the last 24 hours he had two severe chills and vomited repeatedly, the pain in the right iliac region remaining constant. On admission, April 20, 1902, temperature was 102.4 degrees F, pulse 108. He was well nourished. Internal organs were normal. The lower half of the right rectus was slightly rigid. Exquisite

tenderness from McBurney's point downward and inward to the pubis but no distinct mass was to be felt. Rectally nothing except distended intestines could be palpated. Diagnosis acute appendicitis, probably venous thrombosis. Immediate laparotomy was proceeded with. Just before taking the anæsthetic the patient had a very severe rigor. The appendix was located anteriorly to the caput coli lying free and surrounded by omentum. It was 2.5 inches long dusky in color and completely gangrenous. The vessels of the mesentericolum contained purulent thrombi. The vessels of the caput coli could be palpated as rigid cords. This rigidity extended well up along the ascending colon. The appendix was delivered from its omental bed its mesentericolum was ligated at as high a point as was possible and the appendix after its base had been ligated was removed. In the stump of the mesentericolum could be seen the purulent thrombi in the veins. The veins in the stump and in the adjoining portion of the cæcum were slit up and drained by gauze and the wound was closed. The patient reacted well temperature fell during the next 24 hours to 99 degrees F. the pulse rate to 72 with chilly sensations it rose suddenly in the next 4 hours to 103 degrees F. pulse rate 92 it then declined rapidly to 97.8 degrees F. on the third day there after it fluctuated between 99 degrees and 100 degrees F. There was a profuse purulent discharge from the drain opening for 10 days thereafter the wound healed rapidly.

Wilms (29), in 1907, following the reasoning of Trendelenburg in ligating the ovarian (spermatic) veins in cases of puerperal pyæmia suggested a ligation of the veins in the ileocolic angle. He advised a horizontal incision from the anterior superior spine to the rectus muscle and the insertion of the index finger under the lateral aspect of the ascending colon to loosen it with its mesentery and the lower intestine from the posterior abdominal wall. After division of the anterior leaflet of the peritoneum the veins of the ileocolic angle are carefully tied omitting the ligature of the artery. Drainage is placed down to the cæcum in event of subsequent gangrene. This procedure was done on a male of 42 who gave a history of having had two chills and an appendicular abscess of 10 days duration. The abscess was drained but on the third day there was a recurrence of three chills and on the fourth day following the chills the operation described above was performed and the patient recovered. This operation is limited in its application and involves some danger of destroying the nourishment

of the bowel wall. Sprengel (24) subsequently reported a case of a male of 29 who gave a 36 hour history of abdominal pain and an appendectomy with drainage was done for a perforated, gangrenous appendix. Eight days later fever and chills began the latter recurring two and three times daily while the abdomen remained soft and relaxed with complete absence of clinical jaundice. Thirteen days after, the "Wilms operation" was performed. It was rather difficult to isolate the veins of the ileocolic angle because of the fatty retroperitoneal tissues. Chills continued at the rate of two and three a day and then ceased, but a cæcal fecal fistula developed and the patient died 3 weeks after the operation. Autopsy disclosed a fistula of the ileum at the cæcum, and a thrombophlebitis of the superior and inferior mesenteric veins and the finest branches of the portal, with multiple abscesses in the liver. It was quite evident that several veins in the mid portion of the ileocolic angle were not tied. A glance at the variation of the blood supply at the ileocolic angle as pictured by Walcher (27), shown in Figure 1 and Kelly (16) demonstrates the difficulty of successfully ligating all the venous channels.

In 1907 Braun wishing to overcome the technical difficulties of the "Wilms operation" tried an unsuccessful ligation of the ileocolic vein. In 1913 he reported two successful cases. The ileocolic vein which has only one branch opening laterally as a rule is not difficult to expose, provided the ascending colon is drawn to the right, the transverse colon above and the small intestine to the left. The vein then is either seen or felt as a thrombosed cord running from the ileocolic angle, obliquely upward to the right of the spine toward the corner of the transverse mesocolon and the mesentery of the small intestine. This vein is the only channel through which thrombi in acute appendicitis can travel and if it is ligated early, the progress of the infection may be arrested. Some of the following cases given in abstract bear witness to its efficacy.

Braun (5) CASE 1. Male aged 39 had pain in lower abdomen with chill. The following day he became icteric and the next day the pain and fever disappeared. In a few days the icterus was no longer

apparent. He had had two previous attacks in 2 months. At operation through a transverse incision a chronically inflamed appendix was found with an apical abscess, completely walled off. This was carefully packed and about 2 centimeters of the ileocolic vein were resected. No thrombi were found. The wound healed and the patient was discharged as cured.

CASE 2. Male, aged 27 for 14 days had abdominal pain for past 8 days, chills but no jaundice. At operation an appendicular abscess was drained and 8 centimeters of a thrombosed ileocolic vein were resected, the ligature passing through a thrombus which evidently filled the superior mesenteric vein. Cultures of the thrombus yielded innumerable colonies of bacillus coli. The convalescence was quite stormy, chills were present for 4 days and then disappeared together with the icterus. The patient was discharged well.

WEIL (28) CASE 1. Female, age not given, for 14 days had had pain in right lower quadrant and for days had two chills daily. Pararectal incision was made and a retroperitoneal abscess was found extending from the caecum to the root of the mesentery and in it the obliterated ileocaecal vein. The abscess was packed and the vein was ligated high after which an appendectomy was performed for a perforated gangrenous retrocaecal appendix. The postoperative course was stormy; after 3 weeks there was a cessation of the chills and in 10 weeks the patient was discharged as cured.

SUDECK (25) CASE 1. Female, age 17, was sick 8 days with abdominal pain with ten chills on the seventh day. Operation was done through a mid line incision to find the mesenteric vein. This was present as a hard cord. The peritoneum was split the cord followed up to its entrance through the transverse mesocolon where it was tied with catgut, but not excised. The appendix was then ablated and both wounds were packed. After operation, there was only one chill and the patient recovered. In this case, the superior mesenteric vein was ligated.

CASE 2. Male, age 57 had an appendectomy without drainage for gangrenous appendix. Five days after operation he had a chill and bacillus coli in the blood culture. For 6 days he had recurrent chills, seventh and eighth days none, with a return on the ninth. No peritonitis, no exudate were found. At secondary operation the ileocolic and the superior mesenteric veins were enlarged to the diameter of the little finger and the peritoneum over this was reddened. After incising the peritoneum the surgeon found no definite venous thrombus and believing that a purulent thrombolympangitis was present he simply packed the wound. Ten days later the patient died. An autopsy revealed a peritonitis at the site of tamponade, small thrombus in the mesenteric vein and a large liver with multiple emboli in the smallest radicles of the portal vein. The condition was definitely thrombophlebitis. (In this case it would have been better not only to have tied off the vein, but to have incised and drained it.)

FROMME (11) Female, aged 12, for 4 weeks had shown a history of appendicitis, last 3 weeks of which from one to three chills were present daily. At operation the liver was enlarged but no abscesses were evident. The appendix, which was inflamed and covered with omentum, was extirpated and upon dividing the mesoappendix a suppurative phlebitis was found. The ileocolic vein was felt as a hard cord the size of a finger. Upon incising the posterior parietal peritoneum in the region of the transverse mesocolon an abscess was entered containing foul pus. Probing the cavity brought forth a brisk hemorrhage either from the central end of the superior mesenteric or the portal vein itself. This was arrested by pressure. The case was finally discharged healed. (It is hardly possible that in probing a thrombus was dislodged which was washed out by active hemorrhage.)

HEMPEL (14) CASE 1. Male, age 51 had an operation 9 days after first chill. Ileocolic vein was distinctly palpable after ligature, temperature fell. The following days he had several chills with eventual recovery.

CASE 2. A second patient had an operation 10 days after the first chill and disclosed suppurative peritonitis, a thickened ileocolic vein and a perivenous abscess. The vein was ligated. Although there were no further chills, the patient died of peritonitis.

CASE 3. In a third patient, operation was done 5 days after first chill. There was an old inflammation of the appendix. The ileocolic vein was thickened and filled with a purulent thrombus. Exitus 18 days after operation from suppurative peritonitis.

BRUTT (7) states that in 3 cases the thrombosed ileocolic vein was ligated in two several days after operation through a new perirectal incision both died. An autopsy showed the ligature intact with a phlebitis extending to the portal. In the third case the ileocolic was ligated at the time of appendectomy, and the patient who had had two chills and a bacillus coli in the blood culture recovered. (These three cases are from a series of 15 cases of pylephlebitis which occurred in the course of 2,500 cases of acute appendicitis treated at the Eppendorfer Clinic.) The course was always fatal except in the case herewith recorded.

It becomes evident from some of the records of the foregoing cases, and other autopsy findings that the infection may have already spread beyond the confines of the ileocolic vein at the time of its resection or ligation. In these cases, or in those in which the thrombophlebitis may involve the radicles of the ileocaecal angle only, could better results be obtained in preventing infection reaching the liver by a primary occlusion of the portal vein? It has been the general consensus of opinion that sudden occlusion of the portal

vein usually results in death. Cases surviving portal vein ligation are extremely rare if the literature is an index (6 and 8). In fact, in a series of 21 cases of primary portal thrombosis, collected by Lewis and Rosenow (18) only 4 recovered following a resection of gangrenous intestine for a circulatory ileus caused by the portal occlusion. Kehr (15) states that the portal vein may be ligated only if sufficient collateral circulation is present. However secondary thromboses of the portal vein are not rare and are compatible with life, but the process which has caused this is presumably gradual with plenty of opportunity for the development of collateral circulation.

It was Charpy who first described the veins in the gastrohepatic omentum but Pick (22) emphasized their real importance as additional anastomotic channels in carrying blood to the liver in portal obliteration; he gave them the name of hepatopetal veins. Believing that a beginning thrombosis of the portal vein might cause a full development of these hepatopetal veins in the gastrohepatic omentum to such an extent that the porta could be occluded, Neuhof (20) suggested the ligation of the portal vein combined with an omentopexy in cases of pylephlebitis. As noted in Neuhof's experimental studies and the autopsy records of Winternitz (30), such an occlusion has but little effect upon the liver parenchyma because the hepatic artery supplies blood via anastomosis between the two systems and there is an extensive collateral circulation developed in the hepato duodenal ligament.

The portal vein is very large, varying in length from 5 to 12 centimeters with an average diameter of 1 to 1.8 centimeters. It differs from other veins in that its blood contains the products and poisons of the gastro intestinal tract and the spleen. The vein is usually formed by two, three or four branches, i.e. the gastric, the splenic, the inferior mesenteric and superior mesenteric veins. The superior mesenteric and splenic veins unite normally to make the portal, the inferior mesenteric emptying into the splenic. It is not uncommon for the superior mesenteric, splenic and inferior mesenteric to open into a common trunk, which may lie behind

the pancreas or behind the upper or descending part of the duodenum and then come to occupy the lesser omentum slightly posterior to the common bile duct which is on the right and the hepatic artery which is on the left. In its course to the liver it receives the gastric, the cystic and the biliary tributaries. If the gastric vein does not empty into the portal but into the superior mesenteric in case of portal occlusion there is practically no chance for direct circulation except through the hepatopetal veins of Pick. At the portal fissure the vein divides the right branch broad and short going to the right the quadrate and part of the caudate lobes of the liver. The left branch longer and thinner discharges into the caudate and left lobes. The ease with which the portal vein may be exposed in the gastrohepatic omentum is dependent upon the degree of periportal inflammation and omentitis. Probably the easiest approach is to incise the anterior peritoneal leaflet of the lesser omentum and isolate the common duct drawing it to the right by means of a tape great care being taken not to injure the hepatoportal veins (Fig. 2). The portal vein lying on a deeper plane becomes apparent with a little further dissection. The hepatic artery lying to the left is rarely visualized.

Beer (3) in 1915 reported the first case of portal vein ligation in suppurative portal phlebitis. He planned to modify Gerster's original suggestion of incising the portal trunk, evacuating the thrombi by flushing through a catheter and then closing the vein, by 'ligating the vein, and after cutting the vein above the ligature to drain the hepatic end with a rubber tube run into the lumen of the stump and at the same time perform a cholecystostomy to drain the biliary system. The condition of the patient, however, did not permit a drainage of the portal vein. This should be quite feasible and according to Winternitz (30) without much danger of back bleeding because if the smaller interlobular branches of the portal are occluded the anastomosis with the hepatic artery becomes ineffectual and there is a mechanical obstruction of circulation in this area. This is followed by infarct formation, and with

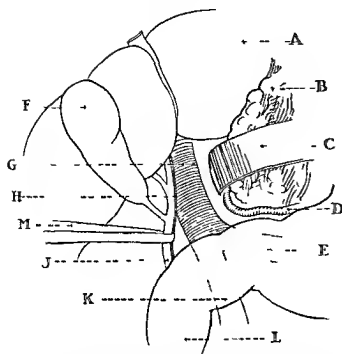


Fig 2 Schematic representation of exposure of the portal vein in Case 3 A Liver, B gastrohepatic omentum C, abdominal retractor D hepatic artery, E splenic vein, F, gall bladder, G portal vein H, hepatopetal vein J common bile duct, K, superior mesenteric vein L duo denum M, tape retracting common bile duct and hepa topetal vein to right

infection present, abscess results. If, however, the hepatic end of the portal vein, when it is incised, should bleed too freely, it could always be ligated.

Herewith are appended the records of 4 cases of acute gangrenous appendicitis complicated by pylephlebitis. In 3, the portal vein, and in 1, the superior mesenteric vein (which, because of adhesions distorting it, was mistaken for the portal), was ligated with the hope of preventing spread of infection and preserving the integrity of the liver tissue. Unfortunately, all these cases ended fatally. Clinically, and at autopsy, these cases presented certain features which are of fundamental importance and justify their review. In Cases 1 and 4, the portal vein was ligated in one sitting. No change was noted in the patient's condition when the vein was first compressed for a variable length of time and none was observed after the ligature had been tied tightly. Case 1 survived about 48 hours. Case 2, in which the superior mesenteric vein was tied at its entrance to the portal, lived about 6 weeks. Case 4 died within 3 hours,

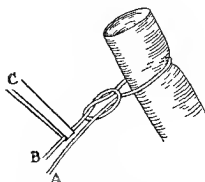


Fig 3 Showing slipknot about portal vein

but what part the portal ligation played is not known, for the patient was desperately ill when operated upon. In Case 3, which survived 8 days, the ligation was performed in two stages because at operation the vein was only slightly edematous and it was thought safer to allow more time for collaterals to develop. This was done even though there were several dilated hepatopetal veins in the gastrohepatic omentum, one of such size that it had to be retracted to the right with tape, and in spite of the fact that digital compression of the portal vein did not produce any alteration in the pulse, respiration or general condition of the patient. At the first operation, a slipknot of Pagenstecher was passed about the isolated vein and its lumen was occluded to about three quarters of its diameter by drawing the long string A, holding the knot steady by a clamp attached to the short end B (Fig 3). Both the string A and the handle of the clamp C protruded from the wound after partial closure of the abdomen. After 36 hours the knot was tightened by drawing upward on the string and the clamp was removed. The patient survived more than 6 days after this, autopsy showing that the vein was completely ligated and that the Pagenstecher had not cut through the vessel wall.

CASE 1 H G, shipping clerk, 25 years of age, married, was admitted February 20, 1915, died March 1, 1915. The father and mother were dead, 5 brothers and 2 sisters were all well. There was no tuberculosis nor cancer in the family.

The patient smoked 10 cigarettes a day and drank occasionally. He had had gonorrhoea 3 years previously, denied syphilis, pneumonia, scarlet fever, typhoid, etc. Two weeks ago he had grippe and sore

*Reported previously in Am J M Sc 1915 cl 548

throat On the morning of February 17 he had experienced general abdominal cramps associated with vomiting constipation chills and fever The general pains subsided and became localized in the right iliac region while thirst frequency of urination and prostration from lack of sleep persisted The general condition was good and patient was well nourished The eyes reacted to light and accommodation There were no palsies no petechiae The tongue was coated teeth were in good condition pharynx was congested tonsils were negative as were ears nasals and thyroid Glands were negative The chest expansion was fair and equal lungs anterior and posterior were negative no dullness, no râles The heart sounds were booming at the apex with slight roughness of the first sound The pulse was equal regular, and of good force with tension not increased but rapid

The abdomen was symmetrical and tympanitic with tenderness rigidity and spasm of the right rectus muscle in the iliac region The rebound sign was positive The spleen kidney and liver were not palpable The rectum showed tenderness and a sense of resistance in the right iliac fossa

February 20 appendectomy was performed for acute gangrenous appendicitis through a right rectus muscle splitting incision nitrous oxide and ether being used

The appendix was found to be entirely gangrenous with fibrinous exudate on tip There was no evidence of thrombosis in the mesenteric lumen The stump was carbolized and the abdominal wound closed in layers

The last inch of the specimen was somewhat bulbous it was gangrenous and contained foul smelling pus

February 21 The patient appeared very septic and had two chills with temperature 99.8 to 105 pulse 106 to 132 Blood culture showed streptococci He had severe pains in the right abdomen and jaundice

February 23 Leucocytes 18,000 polynuclears 94 per cent lymphocytes 6 per cent Since operation the patient had had chills daily and septic temperature The conjunctiva was deeply icteric He complained of pain in the right hypochondrium where there was distinct tenderness over the liver which is distinctly enlarged The wound was clean

February 24 Jaundice was more marked Chills and high temperature persisted Tenderness over the liver was more marked

Diagnosis Suppurative portal phlebitis

Second operation February 24 We intended to anastomose the inferior mesenteric vein and spermatic (left) and do an omentopexy so as to establish collateral circulation preliminary to ligation of the portal vein for pylophlebitis Nitrous oxide and ether were administered

An incision was made along the crest of the ilium to the left of the left rectus muscle The lower pole of the kidney and the ureter were exposed, and the spermatic vein and main branch of the inferior

mesenteric vein isolated Attempt at making anastomosis was unsuccessful because of the very small caliber and thin wall of the inferior mesenteric branch The peritoneum was then opened for an omentopexy and the portal fissure palpated A fair sized indurated area and enlarged glands were palpable at the portal fissure The omentum was brought down and sutured to the parietal peritoneum with plain catgut suture the peritoneum repaired as usual, and the wound closed in layers

No ascites were present The vessels in the omentum and the branches of the inferior mesenteric vein showed little abnormal congestion

February 24 to 27 The patient seemed to remain about the same The temperature was lower and he had only one chill

Third operation On February 27 ligation of the portal vein was done for suppurative phlebitis with cholecystostomy for drainage of the bile tract

A 4 to 5 inch incision was made in the right rectus from the ribs to the level of the umbilicus A small amount of bile stained fluid was found in the peritoneal cavity with marked venous congestion of the stomach and gastrohepatic ligament As the foramen of Winslow was shut off and as the distended gall bladder prevented an easy approach to the region of the portal vein from the right side the peritoneum over the vein was opened just above the duodenum over what appeared to be the site of the portal vein Numerous glands of deep red color blocked the approach and dissection along the tract of the hepatic artery caused very disagreeable bleeding The bleeding was controlled and a cholecystostomy performed Then another attempt was made to reach the vein after the choledochus was exposed for 2 inches This approach was not blocked by glands and exudate and the large blue vein was found mesial to the duct on a slightly deeper plane It was impossible to state that there was a thrombus within though the walls seemed thicker than normal A ligature was thrown about the vein and when it was pulled sufficiently tight to occlude the lumen no change in the patient's pulse was detected Thereupon the vein was tied with heavy catgut A rubber dam was placed along the ligature coming out along the gall bladder tube and the wound closed and dressed

The patient was in a state of shock when returned to the ward at 5 p.m. Under heroic stimulation his condition improved

February 27, 8.15 p.m. Condition fair Pulse of fair tension regular and of rate of 140 Respiration regular and not rapid (34) 8.45 p.m. Condition unchanged Tongue very dry rough and brownish fur on dorsum 9.15 p.m. Salt solution not retained by bowel Answered questions correctly 9.45 p.m. Condition unchanged Looked comfortable Pulse and respiration unchanged Mind perfectly clear 10.45 p.m. Pulse 140 good quality Beats practically same in force but occasionally one of weaker quality was felt Was sleeping Now awake Recognized surroundings and persons previously known to

him Jaundice apparently (artificial light) somewhat less marked Tongue very dry in center Was taking fluids in 2 to 3 dram quantities without vomiting Bile drainage 4 ounces 11 20 p.m. General condition fair Pulse 134, good quality regular in rate and rhythm Did not complain of any pain Jaundice seemed decidedly diminished, particularly of conjunctivæ Breathing was regular, slightly increased in rate

February 28 and March 1 Enemata were effective and flatus was expelled (Edema was present in scrotum, lower abdominal wall (perhaps more on left side) penis, and suprapubic region (Infection?) Retention of 40 ounces of urine was relieved by catheter The lumbar wound was infected and fascial necrosis present The sutures were removed and the wound was opened widely and packed with iodoform gauze Bile drainage amounted to 6 ounces

Blood culture taken in the morning showed bacillus coli In the afternoon the patient became gradually comatose, and died 48 hours after operation without having given any evidence of blood either in vomitus or in stool

Urine report February 21 Amber, acid, specific gravity 10.8 albumin, heavy trace, sugar and bile negative Microscopically hyaline casts epithelial cells, and a few leucocytes

February 22 Bile, negative

February 24 Bile in urine

February 25 Bile in urine Blood culture of 12 cubic centimeters showed streptococcus

February 28 Bile in urine

March 3 Blood culture bacillus coli

Diagnosis Acute suppurative pylephlebitis secondary to acute gangrenous appendicitis Ligature of portal vein Streptococcæmia

Incomplete autopsy Icterus and rigor mortis were marked

No petechiæ were present, and no ascites The portal vein found tied off with catgut about 1.5 centimeters above the head of the pancreas Distal from the ligature, the entire portal system was found to be filled with thick dark brown grumous purulent material consisting of pus mixed with some blood In the portal vein near the bifurcation and in its left main branch, there were also flat purulent thrombi on the vessel wall Proximal to the ligature the splenic and inferior mesenteric vessels were patent The superior mesenteric and its right colic branch were filled with yellowish white purulent material In places there were also thrombi The thrombosed vessels containing yellowish white pus led down to the region of the cæcum and ileocaecal junction The vessels in the immediate neighborhood of the appendix site were empty and showed no suppurative process

The gastro intestinal tract appeared normal, showing no circulatory disturbance The coronary veins along the upper half of the lesser curvature and the retroperitoneal veins behind the ascending colon were widely dilated The liver was slightly enlarged

Its lower border reached down about one finger breadth below the free border of the ribs On section the organ was found studded with numerous small yellowish foci consisting of collections of pus In the immediate neighborhood of each of these areas was a radicle of the portal vein, filled with dark grayish brown purulent material The intervening liver parenchyma showed merely cloudy swelling The common bile duct was patent and contained some thin yellowish bile

The gall bladder was fastened to the abdominal wall by a catgut suture A hole in its fundus was also closed with a suture The gall bladder contained a small amount of mucopurulent material slightly bile stained The spleen was about one half larger than normal

Bacillus coli was isolated from pus from the liver

Microscopic examination of liver showed the capsule normal in thickness There was moderate passive congestion in the centers of the lobules The liver cells in this region were somewhat smaller than normal and contained granules of brownish pigment Throughout Glisson's capsule there were numerous and extensive round cell infiltrations having no relation to the bile ducts and the hepatic arteries In some places there were large collections of pus cells and cellular detritus in the midst of which masses of bacteria were frequently to be seen Most of these abscesses appeared to extend from foci in Glisson's capsule Many of the smaller radicles of the portal vein contained parietal blood platelet thrombi, with lumina containing red blood cells and only rarely collections of pus cells The larger radicles of the portal vein appeared for the most part completely destroyed by a suppurative process and in some places the abscesses extended from this by continuity

The capsule and trabeculae of the spleen were normal in thickness Sinuses in the pulp and the large venous sinuses were markedly dilated The malpighian bodies were rather small contained no germinal centers, and were surrounded by a zone of congestion

CASE 2 Peritonitis acute gangrenous appendicitis with pylephlebitis M. M., male, 27 years of age was admitted September 5, 1920, with headache and pain in the stomach of a week's duration The family history was negative He had gonorrhoea 3 years ago treated for 3 months He was very easily excited During attacks of excitement he trembled from head to foot and had palpitation of the heart

One week ago the patient awoke with severe cramp in the epigastric region followed shortly by repeated vomiting of yellow fluid He took several enemata and toward evening the cramps were relieved but severe headache and fever (103°) developed The following day the headache and fever subsided but the cramps returned The patient had continued to have several attacks each day the cramps alternating with fever and headache Appetite was entirely gone, and the bowels were moved only by enemata and medicine given by the doctor

The only positive findings at examination were rigidity of the whole right side of the abdomen and tenderness in the right lower quadrant. White blood cells 17,000; polymorphonuclears, 82 per cent; eosinophiles, 1 per cent; lymphocytes, 16 per cent; mononuclears, 1 per cent; temperature 103.4 degrees F; pulse 112. The urine showed a very faint trace of albumin.

Operation. Appendectomy and drainage were done for acute gangrenous appendicitis with abscess. Nitrous oxide and oxygen were used. A 4 inch right rectus incision was made. No free pus nor fluid were found in the peritoneal cavity. When the cecum was lifted up a large abscess cavity was entered which extended upward behind the ileocecal junction retroperitoneally. It contained about 8 ounces of foul pus. The appendix was found totally gangrenous except at its base perforated with enterolith free in the abscess cavity. Only a small part of the appendix was intraperitoneal, the greater part extending upward behind the peritoneum and the ileocecal junction a distance of 5 inches. A large collection of pus surrounded the appendix in this retroperitoneal space.

The abscess cavity was evacuated by the suction method and the appendix removed by sharp and blunt dissection. The base was ligated and carbolized. Two medium sized packings and a rubber tube drained the retroperitoneal abscess cavity; one tube led to the pelvis and a rubber tube surrounded the upper set of drains. The wound was closed in layers with pincettes to the skin. The anesthesia was uneventful.

September 6. Culture from throat showed staphylococcus aureus.

September 9. Packing and pincettes were removed and the wound was opened widely. Fascial necrosis was present. The wound was irrigated with Dakin solution and Carrel dressing applied.

September 11. Blood hemoglobin 95 per cent; red blood cells 5,100,000. Smear showed no abnormalities.

September 14. A moderately profuse purulent discharge with foul odor and fascial necrosis were present. Wound was irrigated with boric acid strapped and dry dressing applied.

September 16. Onset of chills suggested pylephlebitis. White blood cells 28,000; polymorphonuclears 87 per cent; lymphocytes 10 per cent; large mononuclears 3 per cent.

September 17. Blood white blood cells 20,000; polymorphonuclears 80 per cent; lymphocytes 19 per cent; large mononuclears 1 per cent. Central pallor of red blood cells with a few macrocytes was present.

September 19. The discharge was much less than hitherto and general condition was unaltered. The wound was cleaned and dry dressing applied. He had three chills yesterday. Examination of the chest showed hyperresonance, diminished breathing, no rales and fremitus over left base especially anteriorly. The splenic dulness was past

September 20. Rectal examination showed a rounded slightly tender bulging mass high up on the right side. Blood culture was sterile. Fluid from chest gave negative smear and sterile culture. X-ray examination of the chest showed a marked elevation of the right diaphragm situated at the level of the fourth costal cartilage anteriorly. The heart was displaced toward the left. The roentgen appearance strongly suggested a process below the diaphragm.

September 21. Fluoroscopic examination of the chest showed the right diaphragm only slightly elevated, moving very freely on respiration although not as well as the left one. If a local collection of pus could be excluded patient probably had a pylephlebitis.

September 22. A pyocyanous infection with profuse purulent foul discharge was present. The tubes were removed and cleaned and wound cleaned with peroxide and alcohol. The skin cleaned with benzine and ether. Vaseline was used on the skin for dermatitis. The tubes were replaced and dry dressing applied.

September 23. Blood culture was negative. September 24. The stool was white yellow formed with no gross blood guaiac negative.

September 26. White blood cells 14,200; polymorphonuclears 80 per cent; lymphocytes 20 per cent; hemoglobin 46 per cent. A citrate transfusion of 425 cubic centimeters was given with no reaction at time of transfusion. The blood was Group I.

September 7. **Operation.** The portal vein was ligated and cholecystostomy was done for the pylephlebitis complicating the appendicitis. Nitrous oxide and ether were used.

Pathology. A slight amount of turbid fluid appeared between the loops of the small intestine. Layer was of normal appearance. Subphrenic space free with no suggestion of multiple abscesses on the surface of liver. Gall bladder was normal. Foramen of Winslow open. No engorged vessels suggested the presence of a collateral circulation except those about the portal vein. The loops of the intestine were not distended. Vessels not engorged. The common duct was normal in appearance. The connective tissue about the portal vein in the portion exposed was infiltrated and adherent to the vein (periphelebitis). There were several enlarged left lymph nodes embedded in this connective tissue. Upon palpation this infiltration about the vein was not very dense. Superficial to the vein were a number of engorged veins, one of which appeared to run parallel to the portal vein. The wall of the portal vein was whitish thickened, and almost completely collapsed. After its ligation the vessel filled only slightly (perhaps half filled) below the ligation.

Procedure. A 5 inch incision was made between the fibers of the right upper rectus with cross cut of muscle toward the median line at the upper angles of the incision. The field of operation was packed off. Exposure of the portal vein was difficult because of the depth. The gall bladder position aided

somewhat in bringing it forward Exposure was attained by drawing up the liver, pulling and holding down the stomach and first portion of duodenum, and inserting the finger in the foramen of Winslow, pushing forward the structures in front of the finger Blunt dissection was made of the peritoneum and infiltrated connective tissue to expose and partly isolate the common duct Troublesome bleeding occurred from the engorged veins about the common duct and portal vein These were caught and ligated The hepatic artery was not seen Identification of the portal vein was made only after some difficulty, the infiltrated connective tissue being at first mistaken for the vein The portal vein was finally exposed completely a ligature was passed about it (3 chronic) at the upper border of the foramen of Winslow While superficial vessels were being clamped off and a cholecystostomy being done, the ligature about the portal vein was slowly drawn upon to occlude it Finally, after some 20 minutes the vein was closed off between fingers No change was noted in the condition, pulse rate, etc Cholecystostomy was done by two tier suture, and the mucosa was inverted about the tube A ligature about the vein was tied tightly as high up as possible (opposite the upper border of the foramen of Winslow, or higher) The abdominal incision was closed with through and through silk sutures, and the cholecystostomy tube drawn out at upper angle Specimen of ascitic fluid and bile showed negative smear and culture Jar tenderness of the right costal margin was noted, also scleral icterus A rectal mass presented exudate with soft spot in center

September 28 Bile, quantity 117 cubic centimeters, showed cholesterol 0.0218 per cent The bile pigment content of gall bladder drainage was 270 milligrams per 100 cubic centimeters

September 29 Bile, quantity 132 cubic centimeters, showed cholesterol 0.0148 per cent The old appendiceal wound had a slight very foul discharge Pyocyanous infection was still present General condition was good Patient had had no chills for two days There was a trace of blood in the stool The bile pigment content of the gall bladder drainage was 250 milligrams per 100 cubic centimeters

September 30 Blood chemistry urea nitrogen 9.8 milligrams per 100 cubic centimeters Incoagulable nitrogen 30.0 uric acid, 1.8 creatinin 1.3 Bile, quantity 132 cubic centimeters, showed cholesterol 0.0148 per cent Blood culture was negative Drainage, quantity 31 cubic centimeters, showed cholesterol 0.0170 per cent The bile pigment content of gall bladder drainage was 260 milligrams per 100 cubic centimeters

October 1 Blood chemistry urea nitrogen, 16.8, incoagulable nitrogen, 30.9, uric acid, 1.7 creatinin 1.0 cholesterol 0.2160 The bile pigment content of gall bladder drainage was 90 milligrams per 100 cubic centimeters The bile showed cholesterol, 0.0144 per cent There was very little jar tenderness

over the right costal margin, slight icteric tint to sclera The bowels moved with enema, were colored had had odor, with no blood He had not had chill since operation, neither had there been any abdominal distention or vomiting

October 2 No blood appeared in the stool Bile, quantity 20 cubic centimeters, showed cholesterol 0.0148 per cent The bile pigment content of gall bladder drainage was 120 milligrams per 100 cubic centimeters Blood chemistry urea nitrogen, 16.8, incoagulable nitrogen 44.5, uric acid, 2.0 creatinin, 1.1 Hemoglobin 48 per cent red blood cells, 2,640,000, white blood cells, 15,600, polymorphonuclears 84 per cent, lymphocytes, 13 per cent, myeloblasts, 3 per cent Smear showed central pallor marked Moderate anisocytosis and poikilocytosis

October 3 A citrate transfusion of 500 cubic centimeters was followed by a chill Dry dressing was applied to wound Bile, quantity 8 cubic centimeters showed cholesterol 0.0125 per cent

October 4 Bile, quantity 91 cubic centimeters, cholesterol 0.016 per cent The bile pigment content of the gall bladder drainage was 200 milligrams per 100 cubic centimeters There was slight engorgement of the superficial veins, no abdominal distention spleen not palpable X ray examination of the chest showed the diaphragm on both sides to be somewhat higher than normal It was, however, normal in contour

October 5 Blood chemistry urea nitrogen, 21.0 milligrams per 100 cubic centimeters, incoagulable nitrogen 43.1 uric acid, 1.8 Bile, quantity 55 cubic centimeters cholesterol 0.0248 per cent

October 6 Blood culture was sterile The temperature was still high On the previous day fluctuation had been, 11 degrees—95 to 106 There was considerable distention of the epigastrium, in fact of the whole upper abdomen This region was tympanitic, with no nausea or vomiting Infection appeared around through and through sutures This was for the first time, when the appendix wound was dressed there was considerable venous oozing through the sinus requiring packing to control Per rectum the mass (pelvic abscess?) appeared larger and there was a soft area in the center General condition was fair There was no occult blood in the stool Hemoglobin was 45 per cent red blood cells, 2,200,000, white blood cells 17,400, polymorphonuclears, 88 per cent lymphocytes 10 per cent, myeloblasts, 1 per cent, basophiles Smear showed central pallor, no nucleated red blood cells

October 7 Blood, coagulation time, 8 minutes Yellowish tint to sclerae

October 8 There was a profuse biliary discharge from the wound after drainage had already ceased for a few days, also considerable oozing from wound Flatness of right chest could be noted posteriorly, with musical rales in left chest, but no evidence of pulmonary edema Condition of the rectal mass remained the same Urine, 24 hour specimen, quantity 1560 cubic centimeters showed total

nitrogen 16.50479 ammonia 1.4149 urea 11.794 About 2 ounces of thick yellow pus was aspirated from the pelvic abscess. Smear showed many spermatozoa and polymorphonuclears. Culture gave bacillus proteus and anaerobic streptococcus.

October 9 Coagulation time was 14 minutes, 34 cubic centimeters of sodium citrate 30 per cent was given at 2 p.m. Considerable amount of biliary discharge through wound with oozing from both wounds occurred. The patient was delirious at times and cyanotic with increased respiration. Marked dullness was noted over the right side of chest and diminished breathing and râles. Upon aspiration of chest and subphrenic region (right side) blood was obtained. Chemical and microscopic examination of the 28 cubic centimeters (bloody) of material from rectal drainage showed cholesterol 0.010 and occasional clumps of white blood cells.

October 10 In the left lung posteriorly were scattered moist râles which in the interscapular region in one place were constant in character. At this place the breathing and voice are bronchial in character. In the right lower lobe was diminished breathing, small moist râles and the note over the entire lung was dull. In the right axilla were friction rubs and small moist râles. At consultation examination of the right axilla, restricted by the patient's condition, metastatic foci were noted in the left lung and probably in the right. The source of these metastatic foci is usually a parietal thrombophlebitis of the hepatic vein. The right lower lobe was partially atelectatic. The patient was delirious most of the day and night, requiring large doses of morphine and hyoscine to keep him under control. Fluid from the wound on smear showed many red blood cells, an occasional white blood cell, no bacteria.

October 12 There was fascial necrosis of the upper wound with profuse biliary discharge but no oozing from upper or lower wound. General condition was somewhat improved.

October 13 Roentgen examination of the chest showed the right diaphragm still abnormally high in position. There was in addition an infiltration involving the greater portion of the left lung which was probably due to a pneumonia.

October 14 Increasing icterus was noted. Urine 2 specimens, 100 grams of levulose given as liver function test. Urine for the next 6 hours faded to show reducing bodies (Normal reaction).

October 17 and 18 Occult blood appeared in stool.

October 19 Liver tenderness was almost entirely gone. The 24 hour specimen of urine quantity 810 cubic centimeters showed total nitrogen 5.8741 grams total urea 7.6788 grams total ammonia nitrogen 1.1656 grams.

October 20 The 24 hour specimen of urine quantity 1.440 cubic centimeters showed total nitrogen 10.4384 grams total urea 10.5408 total ammonia nitrogen 2.7821.

October 21 The 24 hour specimen of urine quantity 810 cubic centimeters showed total nitrogen 5.5323 total urea 6.561 total ammonia nitrogen 1.2336. Upon rectal examination a sinus was found leading into the rectal abscess which was closing down.

October 22 The 24 hour specimen of urine quantity 960 cubic centimeters showed total nitrogen 8.064 total urea 10.8288 total ammonia nitrogen 1.2038. A citrate transfusion of 450 cubic centimeters gave no reaction.

October 23 The occult blood test was positive. The rectal sinus was dilated, nitrous oxide and oxygen being used, and a profuse venous hemorrhage resulted which required packing before it could be controlled. No pus was obtained. There was no evidence of thrombosed internal or external hemorrhoids. The 24 hour specimen of urine quantity 1.620 cubic centimeters showed total nitrogen 9.9792 grams total urea 12.3444 total ammonia nitrogen 1.1976.

October 24 The 24 hour specimen of urine quantity 1.890, nitrogen 9.9489 urea 12.008 ammonia nitrogen 4.2128.

October 25 Thrombosis of portal vein. The 24 hour specimen of urine quantity 1.140 cubic centimeters showed total nitrogen 6.6074 grams urea 9.2340 total ammonia nitrogen 2.4237.

October 26 Blood culture was negative. Blood chemistry: urea nitrogen 14.0 milligrams per 100 cubic centimeters, incoagulable nitrogen 32.0 ureic acid 16, creatinin 15, cholesterol 0.072, bile present. The full blood count 10 cubic centimeters was negative. The 24 hour specimen of urine quantity 1.140 cubic centimeters showed total nitrogen 7.8523 urea, 8.9604 ammonia nitrogen 1.9152.

October 27 X-ray examination of the chest showed a marked elevation of the diaphragm on the right side. The cause of this was not evident. Infiltration was evident in both upper lobes with indistinct signs of a cavity in the upper portion of the left lung.

October 28 Hemoglobin 35 per cent, red blood cells 1,920,000, white blood cells 12,200, polymorphonuclears 67 per cent, lymphocytes 30 per cent, mononuclears 3 per cent. No occult blood in stools. The 24 hour specimen of urine quantity 1.680 cubic centimeters showed total nitrogen 6.4848 grams ammonia nitrogen, 1.5648 urea 9.576.

October 29 No occult blood appeared in the stools.

November 4 At 8 p.m. the chest was full of coarse and fine musical sibilant râles. The patient was quiet after bromides and chloral had been given.

November 5 He ceased to breathe.

Autopsy The peritoneal cavity contains no excess of free fluid. In the ileocecal region is a small abscess about the size of a marble which is completely walled off by adhesions between the cecum and ileum. The mesenteric vessels leading

from this region are apparently normal and entirely free of thrombus. On following the mesenteric veins upward they are found to be occluded at the point where they pass behind the pancreas, the site of the superior mesenteric vein at this point being occupied by an abscess the size of a plum. Just above the pancreas the superior mesenteric vein has been tied off by catgut. The splenic vein is distended and filled with fluid blood. There is apparently no obstruction to the flow of blood from the spleen into the portal vein. The portal vein and all its branches show a marked inflammatory thickening of the wall and contains a purulent clot. In this region at numerous places there are smaller and larger abscesses which have sprung from ramifications of the portal vein.

The liver is about $1\frac{1}{2}$ times the normal size. On section it was found to contain abscesses. The parenchyma between these abscesses is rather brown in color and shows markings of passive congestion. One branch of the hepatic vein leading to the left portion of the right lobe is completely occluded by purulent thrombi.

The gall bladder and bile passages appear to be normal.

The spleen is about 20 centimeters in length. On section it presents the picture of a marked passive congestion together with some swelling of the pulp. The kidneys and adrenals show no gross changes.

The stomach at two places on the posterior wall presents a small erosion about $\frac{1}{2}$ centimeter square. The mesenteric lymph nodes are not enlarged.

Heart. Valvular orifices show no changes. Heart muscle is somewhat brown and of a glassy appearance. Aorta and coronaries. Present only slight evidence of atherosclerotic changes.

Lungs. Both lungs show abscesses in all lobes, two to three abscesses in each lobe varying in size from a pea to a walnut.

Pus from the hepatic vein showed staphylococcus aureus.

Microscopic examination of slides. Heart muscles are edematous, striations of muscle fibers are gone. There is a moderate amount of bipolar pigmentation and perivascular fibrosis. The lung shows large areas of abscess formation with purulent pneumonia and hemorrhage into the lung. The liver is edematous. Scattered throughout the section are numerous large abscesses which are very well walled off by a fibrous wall. Many of the portal radicles contain pus cells. The kidney shows marked passive congestion and degenerative nephrosis. The epithelium of the convoluted tubules is markedly degenerated. The spleen shows marked passive congestion and hypoplasia of the malpighian corpuscles. Numerous polymorphonuclear cells and swollen endothelial cells are present throughout the pulp.

Diagnosis. Suppurative pylephlebitis (appendectomy for acute gangrenous appendicitis with abscess). Suppurative phlebitis of hepatic vein. Multiple abscesses of lung. Retropancreatic abscess. Erosion of stomach.

CASE 3. A. A., female, Russian, 27 years of age, married 2 children, came complaining of abdominal pain of 3 days' duration. The diagnosis was acute appendicitis with abscess.

May 3, 1915. About 3 days previously abdominal pains occurred, gradual in onset, located in epigastrium for 2 days, gradually radiated to right lower quadrant where they remained for 24 hours, sharp and constant, relieved by cold applications, with no relation to meals, getting more severe. Associated with the abdominal pain was anorexia, belching of gas, nausea and vomiting. She had vomited several times every day, but no blood was in vomitus. Fever had been present for 24 hours. She had had 2 chills the day before admission. The bowels moved 24 hours ago with enemata. She took several doses of castor oil 3 days ago and 2 days ago with resulting bowel movements. No blood appeared in stools. She had coughed slightly for the past few hours. No jaundice, urinary or menstrual disturbances were noted except dysmenorrhea with each period and pains in the hypogastrium. The last period was 3 weeks ago.

The patient had had 2 similar attacks 8 and 5 months ago, each lasting about 2 days, with severe epigastric pains (no radiation), nausea, vomiting. Between attacks she had had belching of gas, sour eructations, occasional epigastric pain and nausea. The genito-urinary, cardiac, respiratory, musculo-neurological and eye, ear, nose, and throat examinations were negative.

She had had no former illness nor operations. The family history was negative.

The patient was an obese, middle-aged woman, lying quietly in bed, appearing acutely ill, dehydrated, cyanosed with temperature 104.4 , pulse 122 , respiration 4 . The pupils were regular and reacted to light. Ears and nose were negative externally. The lips were cyanosed, dry, tongue was white coated, dry. Many teeth were filled, tonsils were injected. The percussion note was resonant, breath sounds distant, many sonorous and sibilant rales throughout. There was no enlargement of the heart, sounds were irregular, poor in quality with systolic murmur at apex, percussion note accentuated and reduplicated.

Abdomen. Superficial tenderness in right lower quadrant, deep tenderness in right upper quadrant, right lower, and left lower more marked in right lower, rebound tenderness in right upper and right lower quadrant, rigidity in right upper and right lower quadrant, no masses. Rectal tenderness extended high up on right side. The pelvis was not examined. The skin, bones and joints, and extremities were negative, the knee jerks were $2+$ and equal. A provisional diagnosis of acute appendicitis with local peritonitis was made.

Operation, May 5, 1915. Appendectomy and drainage were done for acute gangrenous appendicitis with peritonitis, nitrous oxide and ether being used. A moderate amount of thin cloudy fluid appeared in the right lower quadrant. The

peritoneum was dull red with little fibrin. The appendix was subserosal in position and thickened and was edematous, very friable and gangrenous at the base. The cæcum was thickened, edematous and friable.

The Kammerer incision was used. Free fluid was aspirated, the appendix mobilized and removed in the usual fashion, ligated with No. 3 chromic catgut, the stump carbolized and sewed with No. 0 chromic purse string suture. A single large rubber tube drained the site of the appendix. The wound was closed in layers. Silk was used for the skin.

A smear of the peritoneal fluid showed gram bacilli culture, *Bacillus coli communis*. The specimen of the appendix showed acute diffuse inflammation.

May 6. Temperature up to 104.6. Chill slight, cough, no pain in chest, somewhat exaggerated breathing with few moist râles at left base, no definite dullness nor bronchial breathing. The abdomen was soft, not tender. There was no vomiting. Sibilant and sonorous rones were noted at both bases posteriorly with dullness and bronchovesicular breathing at right base. It was the impression that bronchitis with bronchopneumonia had set in.

May 7. The abdomen remained soft, not tender, there was no vomiting. A moderate amount of thick, gangrenous, purulent discharge came from the tube, the wound edges were slightly reddened and indurated. Rectal examination was negative. Chills and fever continued with no evident jaundice (temperature swinging in character). The impression was that pyelphlebitis was developing. X-ray examination of the chest did not show any definite abnormality of the lungs.

May 8. The general condition was fair, no chill since 10 a.m. previous day. A fair amount of discharge and some fascial slough were noted. The abdomen was soft and not unduly distended. There was no liver tenderness, no jaundice. Lungs showed a generalized bronchitis.

May 9. The presence of a moderate amount of dark brown, very foul (questionably fecal or faecal) discharge led to opening of lower retention suture and wound, no massive infection disclosed. The medical consultant found signs of chronic bronchitis that is, sibilant, sonorous breathing and moist râles. Heart presented none of the physical signs of mitral stenosis, the accentuated S_1 sound was probably associated with the chronic bronchitis. On deep percussion over the lower right axilla, that is, over the subphrenic and hepatic area, acute tenderness was elicited. Examination of the chest did not reveal any lesion which would account for the chills and fever. Specimen of blood, bilirubin, direct delayed trace present, indirect 1 to 60,000, 1.75 milligrams per 100 cubic centimeters of serum.

May 10. Patient was beginning to appear septic. Temperature was of the steeple type, chills having again appeared after a free interval of 24 hours. The abdomen was slightly distended but soft and

lax throughout. A fecal discharge, very moderate in amount, unquestionably came from a localized fascial slough because when the wound was opened further by removal of sutures, the underlying tissues appeared fairly normal. The rectal examination was negative. No jaundice was apparent, there was some tenderness in the eighth right interspace, clavicular line and some tenderness in the costal arch (right) upon pressure. There was no costo-vertebral tenderness. There seemed to be sufficient evidence that there was a pyelphlebitis and the question arose whether a gradual ligation of the portal vein might not be in order. The hemoglobin was 74 per cent, red blood cells 3,800,000, white blood cells 11,600, polymorphonuclear neutrophils, 81 per cent, eosinophiles 2 per cent, lymphocytes 16 per cent, mononuclears 1 per cent. The smear was normal.

Blood culture was negative. Bilirubin—direct, delayed trace, indirect 1 to 50,000, 2 milligrams per 100 cubic centimeters. Blood culture from portal vein was sterile. Pre-operative culture was sterile.

Operation. A diagnosis of pyelphlebitis was made. Partial occlusion of the portal vein through a right Sprenkel incision was made, nitrous oxide and ether being used. When the peritoneal cavity was opened, there was a gush of about 1 ounce of blood stained fluid. The liver appeared normal and was not enlarged. The gall bladder was distended and there were some fibrinous adhesions matting the structures of the upper abdomen together. The falciform of Winslow was patent. Structures of the gastrohepatic omentum were normal in distribution. The portal vein appeared normal in size and was not particularly edematous. There was some enlargement of the glands along the superior border of the pancreas and the lower border of the gastrohepatic omentum.

The gastrohepatic omentum was picked off. The hepatic artery and common bile duct were retracted to the right by means of a tape. The portal vein was isolated and partially occluded by a No. 4 Pagenstecher ligature passed in the manner illustrated. This was surrounded by a piece of rubber dam. The portal vein was aspirated and blood sent for blood culture. While the portal vein was being ligated partially, there was no change observed in the patient's general condition, pulse or respiration.

Unfortunately the gall bladder was not aspirated. The peritoneum and transversalis fascia were closed with continuous chromic sutures and the fascia closed with interrupted chromic, with silk for the skin. The hepatic artery was aspirated at operation, and the vein was occluded $\frac{3}{4}$ of its lumen.

May 11. At 2 a.m. Unfortunately the gall bladder was not distended at the time of operation and inasmuch as it was distended and the portal vein itself did not show much evidence of inflammation to rule out an empyema of the gall bladder, an exploration was deemed advisable. Accordingly, under nitrous oxide and oxygen anesthesia, the

outer half of the original incision was opened, and the gall bladder aspirated. The bile was not purulent, it looked almost normal. A cholecystostomy was done, purse string of chromic being used. The gall bladder was sutured to the abdominal parietes with interrupted chromic catgut. A rubber tube was used for drainage, and the wound closed in layers. The condition at the expiration of operation was good. The bile was golden brown in color, and thin. It showed bilirubin, 270 milligrams per 100 cubic centimeters and urobilinogen and urobilin negative. The blood chemistry was urea nitrogen 22.4, incoagulable nitrogen, 40, creatinin, 1.0, sugar, 122, cholesterol 190, uric acid, 2.5.

At 9 a.m. The general condition was no worse, temperature, 101, pulse 120, fairly full tongue slightly dry, abdomen soft and lax. Biliary drainage about 2 ounces. The appendix tube was removed and one of soft character and narrow caliber introduced.

At 11 p.m. The general condition was about the same, temperature 102, pulse 118. The tongue was slightly more moist. The portal ligature was tied tight and the clamp removed. The long end of the suture was still in place. No chill had occurred since the operation. Biliary drainage, 2 ounces.

May 12. It was difficult to ascertain the exact indications in regard to the dietetic treatment because of lack of blood sugar determinations. It was important to control in this case with blood sugars at least twice a day.

At 3 p.m. It was now 48 hours since the ligation of the portal vein and since that time there had been no chills and the temperature was 101 with a pulse of 100. The patient was slightly better. There had been no nausea or vomiting and the fluids which had been forced had been well tolerated. Bowels were moving with enemata. The abdomen was soft and lax throughout.

Dressing of the appendix wound disclosed moderate gray foul discharge with odor of fascial necrosis. A tract of fascial necrosis extended for 8 to 10 centimeters under the closed skin wound. The peritoneal sutures were intact. The lower portion of the gaping skin wound was packed loosely with wet gauze after the entire tract had been irrigated with Dakin's solution. Wet dressing was applied. The total biliary drainage from 7 p.m. to 7 a.m. showed bilirubin 100 milligrams per 100 cubic centimeters urobilinogen and urobilin small amounts.

May 13. At 9 a.m. Blood sugar 0.170. 6 p.m. 0.145. 0.110 per cent. The general condition was a little less satisfactory than it had been the previous day at 7 p.m. A chill had lasted 20 minutes with rise of temperature from 99.3 to 101. The temperature at 8 a.m. was 101.2 pulse 100. Definite icterus was present. There had been no nausea nor vomiting. Bowels moved twice spontaneously and stools contained bile. The appendiceal wound was still sloughing with a moderate amount of foul discharge. The biliary discharge was scant. The whites

of 3 eggs (coddled or soft boiled) with purees or thick soups were added to diet. Biliary drainage trace of urobilin, urobilinogen, bilirubin 22 milligrams per 100 cubic centimeters.

May 14. Biliary drainage sterile specimen, 7 a.m. to 7 p.m. trace of urobilin urobilinogen, bilirubin 2. milligrams per 100 cubic centimeters.

May 15. The condition at times suggested cholemia at other times she seemed fairly well. She was now more jaundiced and the chills had been recurring with regularity about every 12 hours. There had been no nausea nor vomiting and the bowels had moved regularly. Fluids were well taken, the amount of urinary output could not be measured because of incontinence. Up to the present time cultures from the portal vein and the median basilic vein had been negative. There was no blood in the stools guaiac negative. The appendix wound was irrigated, a moderate, thick foul discharge was noted fascial necrosis was present the tube was shortened. The wound in the right upper quadrant showed firm union no induration or redness of the margins apparent primary union except at point of cholecystostomy tube exit. Blood chemistry urea nitrogen, 30.8, incoagulable nitrogen, 33.8 uric acid 2.5, creatinin, 1.3, cholesterol 0.07 per cent blood sugar, 0.072 per cent. Biliary drainage 7 a.m. to 7 p.m. showed a trace of urobilin urobilinogen, bilirubin 3 milligrams per 100 cubic centimeters.

May 16. The patient was definitely more icteric. There were numerous small pinhead size papules over the right arm and some periorally. A single specimen of urine showed urobilinogen and bilirubin in considerable quantity. Drainage showed a trace of urobilin urobilinogen and bilirubin, 1 milligram per 100 cubic centimeters.

Van den Bergh direct positive 4+, indirect 12000, 8 milligrams bilirubin per 100 cubic centimeters.

May 17. 8 a.m. Bright red blood suddenly appeared on the dressings of the wound overlying the portal vein. Bright red liquid blood oozed continuously along the dam pressure increasing the flow. The ligature was intact. The impression was that the portal vein was lacerated. Patient was not dyspnoeic. Pulse had not changed in rate or quality. She appeared pallid despite icterus. Loss of blood was estimated at 300 cubic centimeters.

9.15 a.m. There was definite bleeding along the dam in the upper transverse wound and some blood through the cholecystostomy tube. The wound was opened for 2 inches and bleeding definitely established as coming from depths. Packing was introduced above the dam into the region of the gastrohepatic omentum and wound packed with gauze. A sandbag was placed across the upper abdomen 100 cubic centimeters of saline with 10 cubic centimeters of a 10 per cent calcium chloride solution was given intravenously and patient was grouped for transfusion. The van den Bergh reac-

tion was direct positive 4+ indirect 11000 9 milligrams bilirubin per 100 cubic centimeters. At the conclusion of the packing the patient was pallid and definitely shocked with a pulse of 120. For 48 hours there had been no chill and the temperature had ranged from 102 to 101.

1 p.m. The condition was very poor pulse rapid and thready patient comatose respiration slow and longer no external evidence of continued bleeding. A solution of 100 cubic centimeters of a 1 per cent solution of calcium chloride was given intravenously and continuous intravenous saline was started.

The hemoglobin was 43 per cent. A citrate transfusion of 550 cubic centimeters of blood was given.

May 18. The patient was moribund pulse thready with rate of about 120 she was vomiting tarra material. Blood was discharging through tube and still oozing through dressing. The blood van den Bergh direct positive 4+ indirect 19000 3 milligrams bilirubin per 100 cubic centimeters. *Final note.* This was a case of acute appendicitis with abscess complicated by a suppurative pylephlebitis. In order to check the extension of the pylephlebitis into the liver an attempt was made to tie off the portal vein. However fever and chills continued even after the second operation. The condition gradually became worse the jaundice became increasingly severe and the patient died 3 weeks after admission.

May 19. The van den Bergh direct positive 2+ indirect 133000.

Int. psy. Body is that of a well developed and nourished woman about 30 years of age. There is an icteric tinge to the skin. No petechiae. In the right lower quadrant is a partially healed operative incision about 10 centimeters in length and in the right upper quadrant a more recent one situated obliquely and almost parallel with the free costal margin about 5 centimeters below the latter. This second incision is about 15 centimeters in length. Its edges are greenish and brown but there is no suppuration or marked thickening in the wall of the wound. When the abdomen is opened by extension of the upper wound about 80 to 100 cubic centimeters of clotted fluid and blood are encountered. The clots extend down to the region of the porta hepatica. When the upper transverse incision and the lower vertical one are joined and the fibrinous adhesions between the loops of bowel and the parietal peritoneum are separated there is a gush of turbid yellowish foul smelling fluid. The latter is loculated off in several places but is most abundant in the pelvis and cul-de-sac in all it measured about 400 cubic centimeters. The peritoneum in the region of the caecum is chronically and acutely inflamed both on the visceral and parietal surfaces. On the portal vein on the under surface of the liver is a ligature. The liver is moderately dilated both above and below the ligature. The bile ducts lying anterior to it are apparently patent, but there is some pressure upon them by surround-

ing edematous tissue. The gall bladder has an incision and suture at its free upper end and contains no bile. The hepatic artery lying somewhat anterior to the portal vein is grossly negative. When the portal vein is opened an occluding white and red thrombus is found in the distal portion of the ligature and proximal to hepatic portion is broken down grayish black thick purulent material. From this point practically to Glisson's capsule all the branches are filled with the same grayish purulent material. The veins are considerably dilated and adherent to the intima are irregular patches of yellowish, fibrinopurulent material. In several areas the veins seem to open directly into abscess cavities which riddle the liver throughout. The largest of these cavities is about 4 centimeters in diameter the smallest visible ones are pinhead in size. In several places the abscess cavity is honey-combed and contains strands of partially broken down liver tissue. The liver weighs 1480 grams. Where there are no abscesses the liver parenchyma is grossly negative and of the usual brownish red color. The hepatic veins are negative. The portal vein on being traced down shows no other thrombi except the one which extends for about 3 centimeters below the ligature.

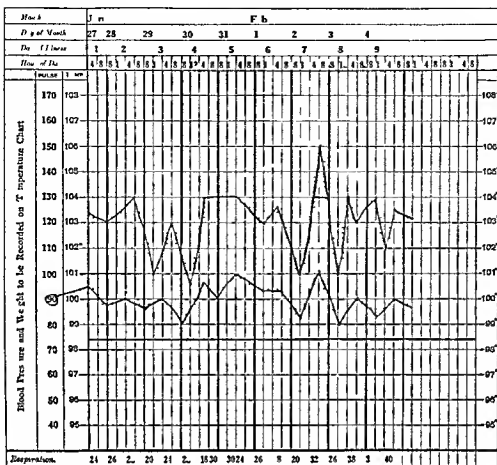
Even in the ileocecal region where the vein lies almost in the center of an abscess there is no gross evidence of phlebitis. The branches coming from the spleen mesentery, and pancreatic regions are grossly negative. There is no evidence of any collateral circulation or any stasis in the vessels leading into the portal vein.

Gastrointestinal tract. The esophagus and stomach contain considerable amounts of black fluid and bloody material. The mucosa is negative. The small intestines from the duodenum to the ileocecal junction show no abnormality. The longer portion of the caecum is somewhat distorted by retrocecal small masses and by adhesions to the parietal peritoneum and lower part of the ileum. The mass behind the caecum consists of an

L shaped abscess cavity the longer portion of it being about 4 centimeters in length and the smaller portion about 3 centimeters in length and 2 centimeters in width. There is a vein passing through the smaller of these two cavities but at no point can any phlebitis or perforation into it be found. The appendix is absent. The remainder of the large intestine is negative.

The spleen is large and flabby and weighs 220 grams. The capsule is thinly covered with purulent exudate. On section, the splenic parenchyma is dark red in color soft and friable. The malpighian corpuscles are barely visible. Splenic vessels are negative.

The adrenals and pancreas are negative. Together the kidneys weigh 340 grams. They are practically normal in size shape and position. The capsules strip with ease revealing smooth surface. Cut section of the organ is yellowish in color. The markings are well preserved. There is normal



relationship between cortex and medulla. The pelves and ureters are negative. The bladder mucosa is the seat of a hamorrhagic and cystic lesion which covers it throughout. The small vesicles composing this lesion, some of which are hamorrhagic, are about 3 centimeters in thickness and apparently do not go beyond the mucosa. There is no apparent break in the continuity of the surface. The uterus is pear shaped, practically normal in size, shape, and position. The endometrium is slightly thickened and at the opening of the right fallopian tube there is a slight submucosal hamorrhage. The cervix is laterally lacerated on both sides. The tubes and ovaries are negative.

The chest is well developed, with no deformities. The lungs are moderately adherent throughout to the parietal pleura but these adhesions can be separated without tearing the lung. The lungs together weigh 880 grams. They are well aerated and salmon pink in color. There is no evidence of infiltration or congestion. There are several packets of intertracheal bronchial lymph nodes varying in size from 3 to 4 centimeters in diameter. These are grayish black in color and homogeneous on section. The bronchi, trachea, and blood vessels are negative.

The heart weighs 440 grams. There are about 40 cubic centimeters of yellowish clear fluid in the pericardial sac. The myocardium is pale red in

color The heart is practically normal in size shape and position The endocardium and valves are negative There is a small opening in the foramen ovale which is loosely covered over by a crescentic edged portion of the endocardium The ductus arteriosus is closed The coronary arteries are patent and of the usual distribution and origin The aorta is elastic and has only very slight superficial atheromatous deposits

Smears of pus contain a variety of Gram positive and Gram negative bacilli and cocci with a pre dominance of Gram negative bacilli. Culture gives *bacillus coli communior*.

Diagnosis Suppurative pylephlebitis, multiple liver abscesses, retrocaecal abscesses (operation, appendectomy, ligation of portal vein) cystitis cystica

CASE 4 J S, age 50, scaleman, male, was admitted to Bellevue Hospital, January 27, 1921, died February 4. The diagnosis was acute appendicitis with pyelophlebitis. On January 25 he first experienced the onset of pain in the stomach. The next day this pain became localized in the right lower quadrant at first dull, later sharp, and non-radiating relieved by heaving over, increased by pressure. He took castor oil with good results. He had slight frequency of urination no pain, no blood, no jaundice, no fever, no chills. The family history

was negative His habits were good and he had had the usual childhood diseases Otherwise his history was negative

Examination showed him to be acutely ill, temperature 103 degrees F pulse 94 respiration 24 The sclerae were conspicuously jaundiced pupils were normal he had marked pyorrhea The rest of the head the neck chest and heart were negative The abdomen was flat not distended with tenderness and slight rigidity in the right lower quadrant Hyperaesthesia was noted over McBurney's point Rebound tenderness was present with no tenderness in right upper quadrant The extremities and rectum were negative A provisional diagnosis of acute appendicitis was made

January 27 Operation was performed under ether anaesthesia through a right rectus incision The appendix was gangrenous perforated near its center friable Free fluid was found in the peritoneal cavity The appendix was removed with cautery and drained Recovery from the operation was fair on the first day

January 28 Urine dark amber specific gravity 1.040 acid trace albumin no glucose hyaline, granular casts

January 29 Atelectatic râles were noted at both bases The general condition was fair He took fluids well Tap water was given by rectum Blood Leucocytes 15,000 100 cells counted polynuclears 92 transitionals 13 lymphocytes 5 Culture of blood was negative after 48 hours bile showed colon bacillus

January 31 The sclerae were icteric The patient was having chills and sweats with sudden rises in temperature A slight discharge appeared in the wound with pain and tenderness in the right upper quadrant Pylephlebitis?

February 1 The right posterior chest was flat between the medial and inferior angle of the scapula The breath sounds were suppressed and bronchovesicular voice was increased fremitus diminished The right anterior chest was dull from the fourth interspace downward The subcutaneous tissues about the nipple were puffy and oedematous The heart showed a soft systolic murmur at the apex Physical signs pointed to a probable subphrenic abscess

February 3 Patient had hiccough temperature of 104 and was irrational

February 4 Operation for pylephlebitis was decided upon Local and nitrous oxide oxygen anaesthesia was used and an oblique right upper rectus incision made The viscera were found engorged with no evidence of abscess of the liver The gall bladder was distended preventing approach to the gastrohepatic ligament which was found thickened with exudate and enlarged glands Over the cystic duct was a fibrous exudate The gall bladder was emptied and the tube inserted A finger was invaginated into the foramen of Winslow and the ligature carried around the hepatic artery and the common duct for traction With these

structures out of the way and the finger in the foramen of Winslow the portal vein was exposed and aspirated, fluid blood was obtained A chromic gut ligature was tied about the vein above the point of puncture The ligation of the portal vein caused no change in the patient's condition The wound was closed in the usual manner The aspirated fluid from the gall bladder was turbid bile The walls of the gall bladder showed no evidence of inflammation Urine green amber in color specific gravity 1.036 acid trace albumin no glucose hyaline and granular casts bile 2 plus

The patient reacted from the anaesthesia with a pulse of 100 The general condition became poor and he was dead 3 hours after the operation

The primary cause of death from post mortem findings in Cases 1 and 3 was hepatic insufficiency the result of diffuse suppuration, it could not be assigned to the direct effect of vein ligation because the patients lived several days following this procedure

Two other important findings disclosed by the autopsies were the absence of ascites and the lack of engorgement and congestion of the veins of the abdominal viscera proving very likely that adequate circulation must have been maintained through collateral channels even though the portal was occluded This is of vital importance It means that either a beginning thrombophlebitis of the portal vein has already opened up collaterals or that the hepatopetal veins in some patients are sufficient 'to carry on' even though the portal may be suddenly and completely occluded

SUMMARY

- 1 The prognosis of pylephlebitis complicating acute appendicitis while grave is not absolutely hopeless If the diagnosis is made before operation, the surgical procedure of choice is a ligation or preferably a resection of the ileocolic vein prior to the appendectomy If this complication occurs or is recognized after operation surgical intervention is of little avail unless indications point to a definite liver abscess when drainage is indicated

- 2 The hepatopetal system in certain individuals can efficiently 'carry on' portal circulation in the presence of a portal occlusion of pylephlebitic origin

- 3 The ligation of the portal vein in cases of pylephlebitis in this series proved of no

value, because of the peculiar pathology of this condition, it is very doubtful whether it is ever indicated. And, should the process have already extended beyond the ileocolic ligature there is still no need for portal ligation, for patients occasionally recover if all of the primary thrombus has not been removed.

BIBLIOGRAPHY

- 1 ARMSTRONG Brit M J, 1897 ii 945
- 2 BARLOW R A Lancet 1919 ii 844
- 3 BEER Am J M Sc 1915 cl 548
- 4 BIER BRAUN and KUMMEL, Operationslehre, iii, 473
- 5 BRAUN Beitr z klin Chir, 1913 lxxvi, 314
- 6 BREWER J Am M Ass 1908 l 063
- 7 BRUTT Zentralbl f Chir, 1922 No 19 p 610
- 8 BURDENKO Deutsche Ztschr f Chir 1913 cxxiv
- 9 BURGE Iowa M J, 1908 xv, 571
- 10 FITZ Tr Ass Am Physicians, 1886
- 11 FROMME Zentralbl f Chir 1925 No 9 p 450
- 12 GERSTER Tr Am Surg Ass 1903

- 13 GIERTZ Ueber akute eitrige Wurmfortsatz Peritonitis Wiesbaden (Lenande) 1909
- 14 HEMPEL Zentralbl f Chir 1923 No 13 p 711
- 15 KEER Neue Deutsche Chir 1915 viii 148
- 16 KELLY The Vermiform Appendix and Its Diseases Philadelphia W B Saunders 1908 p 162
- 17 LENHARTZ H. Nothnagel's Specielle Pathologie und Therapie iii 366
- 18 LEWIS and ROSENOW Arch Int Med 1909 iii 732
- 19 MOSCHOWITZ, A. and E. Arch f klin. Chir 1907 lxxxi No 3
- 20 NEUHOF Surg Gynec & Obst., 1913 xvi 481
- 21 PETRÉN Beitr z klin Chir 1914 xciv, 314
- 22 PICK Arch f path Anat cxcvii 490
- 23 SONNENBURG Pathologie und Therapie der Perityphitis 1913 No 7
- 24 SPRENGEL Zentralbl f Chir, 1911 No 2
- 25 SUDECK Zentralbl f Chir 19 No 17 p 612
- 26 THALHIMER Chills in appendicitis indicating operable pyelophlebitis Arch Surg, 1924 viii 638
- 27 WALCHER Deutsche Ztschr f Chir 191 clxiii, 354
- 28 WEIL Berl klin Wchnschr, 1920 No 1
- 29 WILMS Zentralbl f Chir 1909 xcxi 1041
- 30 WESTERNITZ Johns Hopkins Hosp Bull 1911 xiii, 49

PARASITIC FIBROMYOMATA¹

By JAMES C. MASSON, M.D., ROCHESTER, MINNESOTA
Division of Surgery, Mayo Clinic

JULY 8, 1925, a true parasitic fibromyoma, 6.5 by 3 by 3 centimeters, was removed at the Mayo Clinic in the course of an operation for duodenal ulcer. In the clinic records only two similar cases can be found. There are, however, many with definite indication of interference with the blood supply from the uterus. In some cases the condition was inflammatory with edema and recent vascular adhesions or commencing degeneration with cystic changes in the tumor, but in most cases the parasitic characteristics were evidently of slow development as indicated by the absence of changes in the tumor itself, in spite of the fact that it was receiving most of its blood supply through firm adhesions to other structures, especially the omentum and appendices epiploicae of the sigmoid.

The literature contains very few cases of sequestered, wandering, or parasitic fibromyomata, and most of those reported have been on record for many years. In 1858, West reported one case of a fibromyoma attached

in the cul de sac of Douglas. In 1861, Turner reported one case of a fibromyoma attached at the posterior brim of the pelvis and to the omentum, and Williams mentioned cases reported by Croom, Baldy, Eve, DePaul, Wylie, Rindfleisch, Routh, Wallace, and others. He also described two specimens in the Hunterian Museum, London. Stone reported two cases and referred to others discovered by Edehohls, Knott, and Peterson (4). In 1905, Knott brought the subject up to date and reported two cases of his own. He mentioned several of the cases referred to by Roger Williams and also others quoted in personal communications from J. Whitridge Williams, Nohle, and Martin.

There is no doubt that some cases have been observed in recent years and not yet recorded. The partially parasitic tumors are of frequent occurrence and are only of interest in indicating the preliminary steps in the development of the true parasitic tumors. I have operated on several patients with pedunculated uterine

¹Read before the Western Surgical Association, Wichita, Kansas, December 18 and 19, 1925.

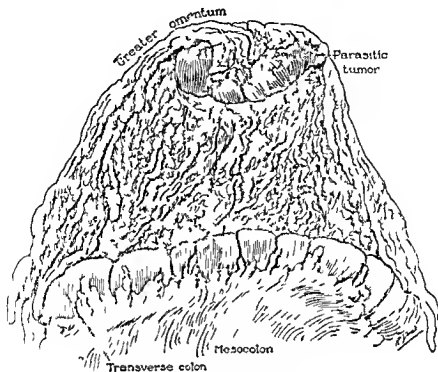


Fig 1 True parasitic fibromyoma

myomata with long attenuated pedicles, and firm vascular attachments to the omentum and other structures which supplied most of the vascular connections necessary for their vitality, in some cases the connection with the uterus was merely represented by a double fold of peritoneum. Myomata of the vaginal wall are by no means rare and without doubt practically all of them arise from the smooth muscle of the vaginal wall. However the possibility of a pedunculated submucous fibromyoma of the uterus becoming attached to the vaginal wall, as the result of pressure necrosis and later losing its uterine attachment has to be admitted, and is well illustrated by one of my cases (Case 6). If there is no contra-indication to a major operation, all parasitic tumors should be removed as they are prone to undergo inflammatory changes which will predispose to new adhesions and such complications as intestinal obstruction or interference with the function of some important organ. The possibility of malignant change also exists as one of the cases reported by Knott was that of a fibrosarcoma. Removal is a simple sur-

gical procedure except in cases in which the tumor has become adherent low in the pelvis or to the mesentery of the intestine. In either case the acquired vascular connection will consist of very short large vessels communicating with the mesenteric system or branches of the internal iliac artery and vein. Great care is necessary in the removal of such tumors on account of the danger of interfering with the blood supply to a section of a bowel, or injury to a ureter.

Myomata may originate in any smooth muscle but most of them originate in the intermediate layer of the uterus, and over 90 per cent in the corpus or in that part of the uterus in which the changes incident to menstruation and pregnancy are most marked and where the muscular tissue is best developed. Just why they are more often found in the fundus and posterior wall is hard to explain.

As myomata increase in size, their location frequently changes. The soft, rapidly growing tumors are, as a rule, completely surrounded by muscular tissue, and when this is incised, they can be expressed with comparatively

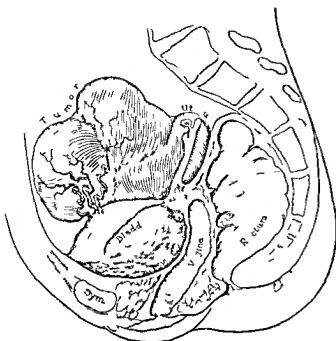


Fig 2 Intra-peritoneal partially parasitic fibromyoma

little bleeding and show no definite vascular attachment. As the tumor increases in size, it often forces its way through the muscular tissue and appears either on the serous or mucous surface, first as a sessile projection and later as a pedunculated myomatous mass. At the same time interference with its circulation increases, and there is a tendency for the tumor to become firmer as the result of an increase of fibrous tissue and decrease in the amount of muscle. It frequently happens that one tumor will develop directly beneath another, and as the later one grows, the more superficial one will be farther and farther removed from its original blood supply. In other cases, the tumor will be extruded from the uterine wall and will remain attached by a definite pedicle of either mucous membrane or peritoneum, through which a more or less impaired blood supply reaches the tumor. Such tumors are prone to undergo degeneration, and, if submucous, will either become adherent to the vaginal wall as the result of pressure necrosis or become infected and cause a foul vaginal discharge. Within the peritoneal cavity, however, they are less likely to become gangrenous, and if interference with the circulation has been gradual, they occasionally become surrounded by a more or less calcareous capsule. Several authors have reported find-

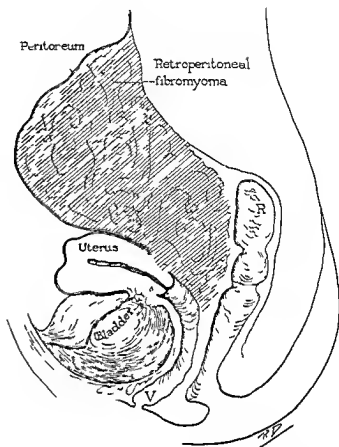


Fig 3 Retroperitoneal partially parasitic fibromyoma

ing such tumors free in the cul de sac of Douglas. In most cases, however, the interference with circulation causes a more rapid degeneration which results in a low grade localized peritonitis. To protect the rest of the abdominal cavity, nature walls in the degenerating tissue with adhesions to the surrounding structures. If gangrene has not already commenced, these adhesions will act as a new source of blood supply. Vessels will rapidly increase in size and in many cases fibromyomata will be found still attached to the uterus, but, from the size and distribution of vessels in the attached structures, it is readily seen that the acquired or abnormal attachments are the main sources of blood supply, and it is evident that, as the forces or circumstances that first tended to interfere with the primary circulation to the tumor still exist, the myoma will ultimately be completely severed from the uterine body and will become in every sense of the word a sequestered or parasitic tumor. Any of the structures in the lower abdomen or pelvis may become

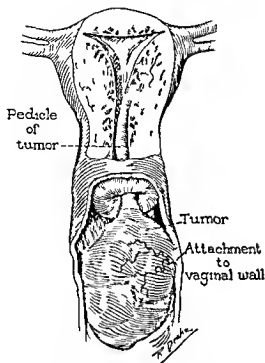


Fig 4 Vaginal partially parasitic fibromyoma

adherent to such a tumor and eventually give it a new or acquired circulation. There is no doubt that in some cases the adhesions to the fibromyoma started as the result of pelvic peritonitis. On account of the increase or decrease in the size or change in the position of the uterus coincident to pregnancy or the development of other pelvic tumors the circulation to the fibromyoma is somewhat impaired. This calls for an increase in the acquired vascular connection, and in the occasional case the tumor becomes completely severed from the uterus and its future growth depends on the richness of this new blood supply.

Kelly and Cullen have emphasized the importance of the omentum in protecting the abdomen from general peritonitis as the result of degeneration in myomata. In their series of cases they illustrate various stages in the development of such tumors. When the tumor is small and receives some sustenance from other vessels there is little or no change in the omentum, but if the tumor is large and receives all or practically all of its blood supply from the omentum, there is marked change in

this structure. The vessels become larger and the fat disappears, leaving large openings between the vessels which in some cases run free from the transverse colon to the tumor.

Many intraligamentous myomata apparently have no vascular connections with the uterus, but I feel that they can hardly be classed as true parasitic tumors since most of them at any rate, have developed from the smooth muscle of either the round ligament or the broad ligament and never were connected with the uterus. Some of these tumors grow very large and have been reported as retroperitoneal parasitic fibromyomata.

In some of the reported cases the condition was suspected before operation, but I feel that a definite diagnosis must be almost impossible before the abdomen is opened. In some cases however, there is a suggestive history of degeneration in a myoma with slight elevation of temperature and pulse rate and definite tenderness on palpation of the tumor which is, as a rule, recognized as being attached to the uterus by a pedicle. As the symptoms disappear the possible development of a secondary circulation can be suspected, and in time such a tumor may become completely separated from the uterus.

Kelly and Cullen reported only two cases of true parasitic myoma but a great many in which the tumor was partly parasitic. I shall report six cases of fibromyoma, in three of which the tumor was truly parasitic. Of the three cases with a partially parasitic fibromyoma, the tumor was intraperitoneal in one (Case 4), retroperitoneal in one (Case 5), and vaginal in one (Case 6).

ILLUSTRATIVE CASES

CASE 1 A woman aged 45 came to the clinic July 8 1925 complaining of stomach trouble. Menstruation started when the patient was 15 and had been quite normal in every respect. She had had an apparently normal menopause one year before admission. She gave a definite history of having had duodenal ulcer for several years but whatever pain she had was generally in the lower abdomen. She also complained of some aching in the lower part of the back when she was tired. Rectal examination showed the uterus to contain many small fibromyomata the pelvis was apparently normal in all other respects. The tonsils showed definite evidence of infection, marked dental sepsis was also present

A diagnosis of duodenal ulcer and numerous small fibromyomata of the uterus was made and operation advised for the ulcer. Operation, July 10, confirmed the diagnosis of duodenal ulcer and gastro-enterostomy was performed. The uterus was found to contain numerous small fibromyomata, and a mass 6.5 by 3 by 3 centimeters was found wrapped up in the edge of the omentum (Fig. 1). This was removed and the pathologist reported it to be a degenerating calcareous parasitic fibromyoma. It had no connection with the uterus whatever. Convalescence was uneventful.

I believe that some of the low abdominal pain of which the patient complained was due to interference with the circulation of the fibromyoma which at the time of operation was receiving its entire blood supply from the great omentum.

CASE 2. A widow aged 59, registered at the clinic October 8, 1918. Her chief complaint was goiter which had been noticed 24 years before. Thyroidectomy was advised and performed October 15, 1918. Physical examination showed the presence of an abdominal tumor extruding into the pelvis and filling it. A subtotal abdominal hysterectomy was performed and both ovaries and tubes were removed because of a calcareous fibromyoma the size of the uterus of a 6 months' pregnancy. A parasitic calcareous myoma 15 by 12 by 6 centimeters which was walled in by the omentum and several loops of small intestine and connected to the fibromyoma in the uterus by a few filmy adhesions, was also removed. The operation was difficult on account of the adhesions and considerable raw surface was left on the loops of small intestine which were connected with the parasitic tumor. The patient had two large gall stones, the removal of which should be considered later. The appendix was atrophic and was not disturbed. The patient made a good recovery.

CASE 3. A widow, aged 33, came to the clinic September 23, 1919. She complained chiefly of fever and general weakness. Menstruation began at the age of 16 with periods and flow normal in every respect. There had been a brownish discharge from the uterus during the entire month for a period of 2 years which necessitated the wearing of a napkin. There was no history of abnormal bleeding at the menstrual periods. A diagnosis of uterine fibromyoma had been made by her physician. Examination showed a large pelvic tumor rising to the level of the umbilicus which was thought to be attached to the uterus. October 2, 1919, through a low incision in the median line the tumor was explored and found to be a true parasitic fibromyoma undergoing degeneration and completely walled in by the omentum. There was considerable soiling from the spilling of necrotic material, and it was thought advisable to insert a drain. The pathological report was necrosing detached fibromyoma. The patient's recovery was satisfactory.

CASE 4. A married woman aged 40, came to the clinic July 13, 1925, complaining of menstrual disturbance and of a pelvic tumor which had been present for a period of 2 months. The periods had always been regular every 4 weeks until June 1925 but for the last 6 or 8 months, the flow had been about 25 per cent more profuse than before and required about three or four napkins a day. The June period was missed and July 4 at the regular time there was a gush of blood followed by a very profuse flow for a few hours. Eight hours from the time of the onset the flow had practically ceased. A month previous to her visit to the clinic the patient discovered a large lumpy tumor in the lower abdomen and also marked distention.

She was a fairly well developed woman of 5 feet 7 inches, weighing 135.5 pounds. The tonsils were cryptic and the teeth showed evidence of much dental work. The thyroid was palpable. There was a large irregular tumor arising out of the pelvis situated more to the left than the right and extending above the umbilicus. It felt firm and nodular like multiple myomata. A diagnosis of multiple fibromyoma was made and operation advised. July 20, 1925, subtotal abdominal hysterectomy was performed for multiple fibromyoma of the uterus. One partially parasitic fibromyoma was found, the left tube and ovary and appendix were also removed. The uterine fibromyomata formed a mass the size of a uterus at 6 months' pregnancy. The circulation from the uterus to the fibromyoma on the anterior surface was markedly disturbed, the tumor getting a good deal of its blood supply from adhesions to the bladder (partially parasitic fibromyoma, Fig. 2). The appendix showed definite evidence of disease.

CASE 5. A woman aged 30 registered at the clinic November 29, 1921. She had been married at the age of 33 and had never been pregnant. Menstruation began at the age of 14 years and had been fairly regular with a moderate flow until the past year. For a year previously she had suffered from rather severe backache and a heavy pressing feeling in the lower abdomen. The backaches were intermittent, the attacks lasting 2 or 3 weeks, and the intermissions from 5 to 6 weeks. For the preceding year menstruation had been irregular at intervals of from 3 to 6 weeks, the amount was variable and there was no clotting.

She was a well nourished woman 5 feet, 9 inches tall weighing 200 pounds. The teeth and tonsils were septic. Arterial hypertension was present. There was a large tumor in the pelvis and abdomen. The tumor was explored through a low incision in the median line and found to be a single degenerating fibromyoma, about the size of a uterus in an 8 months' pregnancy, attached by a pedicle to the cervix and lying entirely behind the peritoneum (Fig. 3). The uterus contained several other very small fibromyomata, but on account of the retroperitoneal dissection hysterectomy did not seem advisable in the absence of symptoms from the

fibromyomata The pathological report was a single degenerating cystic fibromyoma of the uterus. Recovery was satisfactory.

This case of pedunculated fibromyoma is reported simply to illustrate how some of the retroperitoneal fibromyomata may be true parasitic tumors.

CASE 6 A woman aged 50 registered at the clinic December 14 1922 complaining chiefly of tumor. She also complained of a dull pain in the left lower quadrant constant for many years and brought on by hard work. It had been continually growing worse. She was relieved when lying on her back. Six months before she first noticed a protrusion from the vagina which came on after she had done some hard pumping. She went to bed and the protrusion disappeared. It was not noticed again until 2 weeks before her admission when it again appeared and remained for several days. The patient was finally unable to urinate. Her physician catheterized her and replaced the tumor. Following this procedure there was a discharge of about a pint of foul smelling blood stained pus. This discharge continued for a day or two afterward. There had been no fever. For 6 years before admission she had flowed once or twice a year with apparently normal periods. She had had hot flashes and so forth.

She was a poorly nourished woman 5 feet 5 inches tall weighing 129 pounds. The tonsils were cryptic and only one tooth remained. The bladder was full and rigid and the patient was apparently unable to empty it. A movable tumor which tended to bleed on manipulation was found filling the vagina. A diagnosis of fibromyoma of the uterus was made and operation seemed indicated. A pedunculated submucous fibromyoma which was protruding through the cervix was removed. The fibromyoma was adherent to the left lateral wall of the vagina (Fig. 4) and during the separation the mucous membrane was torn slightly. This was

sutured with chromic catgut. The pathological report was pedunculated submucous fibromyoma weighing 130 grams. The patient recovered satisfactorily.

This case is reported to show the possibility of a uterine fibromyoma becoming parasitic in the vagina.

CONCLUSIONS

- 1 True parasitic fibromyoma is very rare.
- 2 It is difficult to diagnose.
- 3 It should be removed because it may interfere with the function of important organs and because malignant changes may develop.
- 4 It may adhere to any of the lower abdominal or pelvic structures or some other part of the uterus itself or the vaginal wall and its removal may thus become difficult.

BIBLIOGRAPHY

- 1 KELLY H. A. and CULLEN T. S. Myomata of the Uterus. Philadelphia W. B. Saunders Co. 1909 p. 13.
- 2 KNOTT VAW. BUREN. Wandering or aberrant uterine fibromyomata. J. Am. M. Ass. 1903, xlv, 10-11.
- 3 STONE I. S. Migrant tumors of the uterus and ovary. Gynecological Tr. 1898, xxii, 411-421.
- 4 Idem. Wandering parasitic or aberrant retroperitoneal uterine fibromyoma. Two cases. Am. J. Surg. 1906, xi, 40-43.
- 5 TURNER WILLIAM. On separation and transplantation of the ovary due to atrophy of the broad ligament and fallopian tube and on the spontaneous separation of subperitoneal fibrous tumors of the uterus. Edinburgh M. J. 1861, vi, 698-707.
- 6 WEST CHARLES. Lectures on the Diseases of Women. Philadelphia. Blanchard and Lea 1838 p. 210.
- 7 WILLIAMS W. ROGER. Uterine Tumor. Their Pathology and Treatment. London. Tindall and Cox 1901 p. 75.

PITUITRIN ADMINISTERED AT THE BEGINNING OF THE THIRD STAGE OF LABOR¹B. R. A. SCOTT, M.D., F.A.C.S., EVANSTON, ILLINOIS
Obstetrical Department, Evanston Hospital

DURING the past 3 years, at the Evanston Hospital, one half cubic centimeter of pituitrin has been injected intramuscularly at the beginning of the third stage of labor as a routine procedure. In order to estimate the value of this procedure, the records of 1,000 consecutive cases in which pituitrin was used were reviewed and the results compared with 1,000 earlier cases in which pituitrin was not used. Special consideration was given to (1) the duration of the third stage of labor (2) the amount of blood lost during the third stage of labor (3) the number of cases requiring manual removal of the placenta, and (4) the number of cases of postpartum hemorrhage.

The 1,000 patients of the control series were delivered in 1920, 1921, 1922, the patients of the pituitrin series in 1923, 1924 and 1925. In both series the placenta were routinely expressed by mild Crede as soon as there were any signs of beginning separation.

Table I shows the effect of pituitrin on the duration of the third stage of labor. A comparison is made between results in the cases in which pituitrin was administered and those in which it was not administered.

For a fuller analysis of the effect of pituitrin the cases are divided into spontaneous and operative deliveries and again into spontaneous and induced labors. These groups are subdivided into primiparae and multiparae and in the induced labor cases a further subdivision is made showing whether labor was induced with castor oil, ouaine and pituitrin or with the Vorhees bag. Analysis of Table I shows that the average duration of the third stage of labor in the pituitrin cases was definitely shorter in each group than in the non-pituitrin cases regardless of the type of delivery or whether labor was spontaneous or induced and regardless of the mode of induction of labor.

It would also appear that the use of pituitrin in induction of labor did not prevent its effect when given again at the beginning of the third stage of labor.

Table II shows the effect of pituitrin on the amount of blood lost in the third stage of labor. As in Table I a comparison is made between cases in which pituitrin was used and those in which pituitrin was not used. The cases are again grouped as in Table I. It is seen that in every group the average amount

TABLE I—EFFECT OF PITUITRIN ON DURATION OF THIRD STAGE OF LABOR

		Non-pituitrin cases				Pituitrin cases			
		No. Cases	Time in minutes			No. Cases	Time in minutes		
			Shortest	Longest	Average		Shortest	Longest	Average
Spontaneous delivery	Primiparae	246	4	80	14	243	2	47	9.7
	Multiparae	505	1	100	12	10	1	100	9.1
Operative delivery	Primiparae	163	5	45	13	156	3	60	10.1
	Multiparae	9		5	12	36	3	50	8.7
Spontaneous labor	Primiparae	37	3	40	11	6	3	6	9.0
	Multiparae	32	1	15	12.1	1	1	100	8.8
Induced labor	C O Q & P	1	4	20	14.0	5	3	9	8.3
	Vorhees bag	17		5	14			7	9.5
	C O Q & P	1			2	5	4	15	11.5
	Vorhees bag	0		16	0		2	25	9

SYMMETRICAL CONGENITAL BRACHYDACTYLIA

REPORT OF FIVE CASES

BY SAMUEL W. BOORSTEIN, M.D., F.A.C.S., NEW YORK

CONGENITAL bone abnormalities are now being studied with great interest. Many unsuspected abnormalities have been discovered with the aid of the X-ray. Some of the hitherto undefined bone diseases have been cleared up through these studies. Some types diagnosed as fractures are now being correctly classed as congenital abnormalities of the bones, hence the advisability of taking radiograms of the affected and the apparently normal sides for comparison. Abnormalities of the carpals and tarsals are of very frequent occurrence. Following the work of Dwight (4), Geist (6) has made careful studies of the tarsals and has contributed valuable articles showing the additional number and great varieties. Scoliosis has been found to be due to abnormal vertebrae. The region of the lumbosacral joints is still a fruitful field for these studies as evidenced by many recent articles in the orthopedic journals. Deformities of the metacarpals and metatarsals are not commonly reported. Dwight states: "There is a long type and a short type of metacarpal variation. The short is more important as it is often at least one-half of the ordinary length. Two or three fingers may be affected in one or both hands though without perfect symmetry. He records only one case showing shortening of the fifth metacarpal and calls it a remarkable incident. He mentions nothing about metatarsal shortening. Day (5) and Lewin (8) report cases of short metacarpals."

I trust therefore that the report of the following five cases which includes one with complete description roentgenograms of two cases in the same family and a review of two similar cases previously reported by me (1) will be of interest.

Olivia M., female, age 17, referred to me by Dr. B. A. Turkel for scoliosis. The physical examination of the patient showed a scoliosis dorsolumbar following an empyema and rib resection. On examining the extremities I found that there was a shorten-

ing of the fourth toe on the right side and third and fourth on left. One could easily surmise that the defect was in the metatarsals. She had double weak feet but otherwise the feet looked normal.

The hands also showed a congenital abnormality. They were rather small for a girl of her age and size. The right hand had shortening of the middle finger the tip reaching only to the tip of the ring finger. Left hand also had short middle finger though not as short as the right.

Koentgen ray examination by Dr. T. B. Weinberg showed short fourth metatarsal on right (Fig. 1), short third and fourth metatarsal on left together with an astrigulum—extra astragalus (Fig. 2 and 3). The third fourth and fifth metacarpals of both hands were short (Figs. 4 and 5). The spine showed a slight abnormality in the body of the fifth.

In order to clear up the hereditary history, Dr. Weinberg examined and took roentgenograms of the other members of the family. He found that the father had short fourth fingers, the one on the right hand being the longer. The roentgen ray showed that the short fourth metacarpal of left hand was exactly the same shape as the one of the daughter (Fig. 6).

He found that a younger sister, aged 12, had small third and fourth right and left metatarsals. He found that she had shortening of the last two toes on the right side and the last three toes on the left. Hands had shortening of the little and ring finger on the right but not as much as the ones of her sister. There was also shortening of the left little finger.

There may be some other member in the family with the same deformity but we are unable to trace them at present.

Thus case is no doubt hereditary as abnormalities were found in other members of the family.

I will now review the report of my first two cases published in 1916 as the deformity was similar to this one.

CASE 1. M. L., female, aged 35, consulted me for pain in her feet. Examination showed a plain case of double weak feet. On inspection I discovered that the fourth toes of both feet were shorter than normal. While I was trying to find where the defect lay, the woman voluntarily offered the information that the deformity was congenital and that both hands showed exactly the same peculiarity. The hands really presented shortening of both ring fingers, the tips of the e were even with the tips of the little fingers and the knuckles of the ring



Fig 1 Case 1 O M Roentgenogram showing right foot Note short fourth metatarsal and change in the first phalanx of that toe



Fig 2 Case 1 Left foot Note short third and fourth metatarsals with changes of first phalanges

Fig 3 Case 1 Left foot Note the os trigonum

fingers were on a higher level than the knuckles of the other digits. There was no complaint of weakness of the hands and the muscular power was normal.

On inquiry into the hereditary history she told me that her two sisters, an uncle, an aunt, her grandmother and four other members of the family showed exactly the same defect, and that was the reason why she never worried about the unsightly appearance of her finger on which she wore her marriage ring. She said that there might be some more relatives with the same deformity, but she was not acquainted with them. (I did not make out a family tree.)

Roentgenograms (Figs 7 and 8) showed clearly the shortening of the fourth metacarpals in both hands. The fourth metatarsals are also shorter than normal.

CASE 2. A F female aged 19 came to me complaining of cold feet, which on examination was

shown to be due to poor circulation with low arterial pressure. On examination of the upper extremities the little fingers were found to be shorter than normal, the tip reaching to about the middle of the mid phalanx of the ring finger. There was nobody in her family who had a similar deformity. Roentgen ray showed shortening of the fifth metacarpals (Fig 9).

When the article containing the reports of the last two cases was published, Dr Congugan sent me a photograph of a patient that he had had with similar deformities and wrote that the father had the same abnormalities (Fig 10). He mentioned that the distal phalanx of the thumb of these two patients was short.



Fig 4 Case 1 Right hand Short third fourth and fifth metacarpals

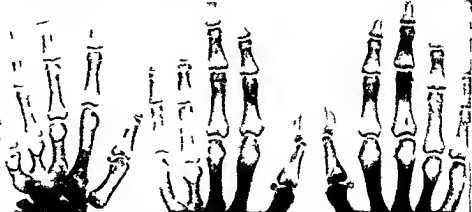


Fig 5 Case 1 Left hand Short third fourth and fifth metacarpals

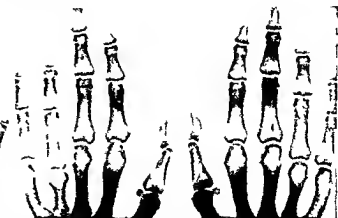


Fig 6 Roentgenograms showing right and left hands of the father in Case 1 showing the short right metacarpal while the left is the same in shape as the left metacarpal in Case 1

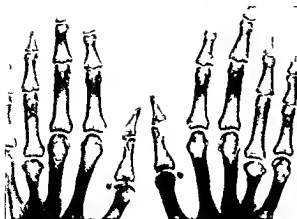


Fig. 7 (right) Ca e 4 (previously reported) M. L. Right hand showing short fourth metacarpal

Fig. 8 Case 4 (previously reported) Left hand showing same deformity as the right hand

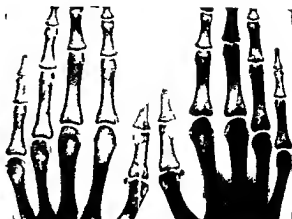


Fig. 9 Case 3 (previously reported) Roentgenogram of both hands showing the symmetrical shortening of the fifth metacarpals. No one in this family had a similar deformity

In discussing the cause of these deformities I will quote from a previous article (1) in which I stated: To discuss the origin or the cause of this particular deformity we will quote here the statements of the authorities Keibel and Mall (7) who give the following conclusions: Agenesis or failure of skeletal development may be due either to primary lack of origin of a part or to an affection which destroys the skeleton anlage after it has begun to differentiate. It is found more often in the vertebrae less often in the bones of the extremities. Hypoplasia or underdevelopment of the skeleton whether generalized or confined to a part may be due either to prenatal or to postnatal conditions. The failure of the bones to develop normally may be due (1) to lack of active proliferation of cartilage (characteristic of cretins) (2) to inactivity of the process of ossification (3) to a premature union of epiphysis with the main part of the bone (4) to growth of connective tissue between the growing cartilage of a bone and the region where ossification usually extends into the cartilage (micromelia chondromalacia fetal rickets) and (5) to inflammation and other abnormal conditions affecting the growing parts of the bone. In this case one may conclude that it is due to a primary lack of origin of the anlagen rather than to an affection which destroys the skeleton anlagen after it has begun to differentiate, especially when one considers that in all these cases the

condition was hereditary. The form is the one due to an early ossification between the epiphysis with the diaphysis. This is shown by the roentgen ray of our first case. Cohn's (2) studies on development of the metacarpals and metatarsals are of interest in this connection. He says: Development—Each bone has two centers, a primary one for shaft appearing early in the third month of fetal life and one for an end appearing in the third year. The secondary center is for the distal end in the four inner metacarpals and in the proximal of the first that is at the end toward which the nutrient artery does not run. They fuse at about eighteen years.

The metacarpals are preformed in cartilage and ossify from a diaphyseal center for the shafts and an epiphyseal center in the base. The epiphyseal centers appear after birth. (Roberts and Kelly's *Fractures*.) No mention is made of the period of ossification.

Metatarsals. Each metatarsal has two centers. The primary center appears in the eighth intra uterine week, the other appears in the third year of life. Consolidation takes place from the fourteenth to the twenty first year. (Morris's *Anatomy*.)

Development. Centers for the shafts of the metatarsals appear toward the end of the third month of fetal life. A proximal epiphysis for the first and distal one for the others appear in the third year, fusing at about seventeen. (Piersol's *Anatomy*.)

"The metatarsal bones are each developed by two centers—one for the shaft and one for the distal extremity in the four outer metatarsals, one for the shaft and one for the base in the metatarsal bone of the great toe. Ossification commences in the center of the shaft about the ninth week, and extends toward either extremity. The center in the proximal end of the first metatarsal bone appears about the third year, the center in the distal end of the other bones between the fifth and the eighth year, they become joined between the eighteenth and the twentieth years. The phalanges are developed by two centers for each bone, one for the shaft and one for the metatarsal extremity. The center for the shaft appears about the tenth week, that for the epiphysis between the fourth and the tenth years they join the shaft at about the eighteenth year" (Gray's *Anatomy*)

This indicates that the centers of ossification for the metacarpals and metatarsals do not form just exactly at the same time and hence an amniotic pressure is not liable to give that symmetrical occurrence especially when the father and the daughter have exactly the same deformity and the same shape of the fourth metacarpal shaft.

Gaenslen (5), speaking about bilateral deformity of tibia and fibula makes the following statements which will be of interest here: "The endogenous or germinal theory, absence or defect of the long bones, is dependent upon defect in the anlagen of the skeleton. This view has been warmly defended in recent years by Ham and Slingenberg. According to the latter, the germ defect is variable in extent resulting in corresponding defects in the long bones. If complete there will be absence of one of the long bones as well as of the corresponding tarsals, metatarsals and phalanges, the typical Strahldefekt or ray defect of Gegenbaur."

It is difficult to imagine pressure from amniotic adhesions or bands so accurately adjusted as to cause the same deformity in father and child though one would be inclined at first to think so, as this patient shows symmetry in the shortening of the third metacarpal of each hand (Figs. 5 and 6)



Fig. 10 Case 6 Short metacarpal of the right hand

On the question of the classification, i.e., under which heading to place these cases of brachydactylia we suggest following the classification of Steindler (9), viz: "Dysplastic conditions (1) chondrodystrophy, (2) brachydactylia (some cases), (3) fusion of carpal bones." The brachydactylia is usually due to short metacarpals.

Concerning treatments nothing can be offered. If these studies may not be of immediate help to the surgeon they may be of help to the biologist. They may perhaps, be of help in medicolegal cases in deciding whether the deformity is due to injury to mother or hereditary.

CONCLUSIONS

1 Congenital shortening of metacarpals is frequently the cause of brachydactylia (short fingers)

2 Bilateral congenital malformation can generally be traced to heredity while a unilateral congenital malformation may be explained on principles of embryonic pressure defects

3 Cases of short fingers should be reported with the same accuracy as polydactylism so as to facilitate the studies of the embryologist

4 The origin of the metacarpals and metatarsals is similar though the center of ossification may not be so as seen by the similar deformity in my cases

5 The fourth metacarpal was the most frequently involved in my series

6 The fourth metatarsal is also frequently involved

7 The deformity is due to a lack of origin of the anlagen rather than to an affection which destroys the skeleton anlagen after it has begun to differentiate as the condition is so often found in families

I desire to acknowledge my great appreciation to Dr T B Weinberg for the special interest to examine the other members of the family whom I could not see also for the careful roentgenograms I feel that without his aid this study would have been impossible

BIBLIOGRAPHY

- 1 BOORSTEIN SAMUEL W A symmetrical congenital malformation of the extremities *Ann Surg* 1916 LVIII 192
- 2 CORN ISIDORE Normal Bones and Joints New York Paul B Hoeber 1924
- 3 DAY H F A symmetrical developmental defect resulting in an anatomical anomaly *Am J Orthop Surg* 1915 XII 3
- 4 DWIGHT THOMAS Clinical Atlas of Variations of the Bones of the Hands and Feet New York Lippincott 1900
- 5 GAENSLEN F J Congenital defects of the tibia and fibula *Am J Orthop Surg* 1915 VII 3
- 6 GEIST FRITZ S Supernumerary bones of the foot a roentgen study of the feet of one hundred normal individuals *Am J Orthop Surg* 1915 XII 3
- 7 KEIBEL I and MALL L P Manual of Human Embryology New York Lippincott 1910
- 8 LEWIN PHILIP Congenital absence or defects of the bones of the extremities *Am J Roentgenol* 1917
- 9 STEINDLER ARTHUR Congenital malformations and deformities of the hand *J Orthop Surg* 1920 XVII 12

THE X-RAY TREATMENT OF HYPOFUNCTION OF THE OVARY

WITH SPECIAL REFERENCE TO THE REGULATION OF MENSTRUAL FUNCTION

BY I SETH HIRSCH M.D. NEW YORK

Director of X-Ray Laboratories Bellevue and Allied Hospitals

THE use of the X-ray in certain diseases associated with disturbed ovarian function is well known. Under a certain dosage, definite changes may be produced which are known as roentgen castration. This dosage depresses or abolishes the ovarian function controlling menstruation, and by destroying the ova produces sterility.

As suggested by Opitz, Van de Velde and Fraenkel were able to induce regular normal menstrual cycles in cases of amenorrhœa and hypomenorrhœa by applying a *fraction* of the dosage required to produce an abolition of ovarian function. If normal regular menstruation and fertility are evidences of normal ovarian function, then delayed, scanty, or absent menstruation and sterility may be said to be symptoms of a hypofunction or a diminished ovarian functional state. The method of treatment to be described has, therefore, been called the stimulative treatment of the ovary, or the treatment of ovarian hypofunction.

On the other hand, in certain cases, menstruation irregular in interval, duration, and amount, occasionally scanty and occasionally profuse, cannot be ascribed either to hypofunction or hyperfunction but to dysfunction or a disordered function in which the X-ray treatment acts as a regulator. This explains the double title of the paper, which concerns itself with the treatment of delayed scanty or absent menstruation and the sterility usually associated with such symptoms.

The indications for this method of X-ray treatment are circumspectly limited and it is therefore important that the diagnosis be established with accuracy. What I have stated in a previous article may be repeated.

"The gynecologist and the radiologist are both concerned in the application of the X-ray as a therapeutic agent and a close co-operation between the two is essential if effects are to be obtained and the treatment properly and honestly applied. Without a correct diagno-

sis without proper control by the gynecologist without a proper selection of cases, the radiologist works blindly and often to the detriment of his patient. In fact, the radiologist is but the assistant of the gynecologist, and the keener his diagnostic ability, the closer his scrutiny of the cases, the more effective are the results.

"In reference to the radiologist, there is to be said that he must apply the rays with brains, that although certain fundamentals must be adhered to which are the essentials of technique he must remember that he has a living human being to deal with who responds and reacts in manifold ways to the application of this powerful agent and that as much clinical judgment is necessary in prescribing a dose of radiation as in prescribing a dose of any powerful drug utilized in medicine."

In this particular work I have been fortunate in having the co-operation and assistance of Dr. A. J. Rongy, to whom I desire to express my indebtedness.

CLASSIFICATION

The menstrual deficiencies may be classified as follows:

As to cause: (1) essential, due to changes in the generative organs, (2) symptomatic, associated with such systemic diseases as chlorosis, tuberculosis, etc.

As to type: (1) complete cessation—amenorrhœa, for months or years, (2) scanty amount normal interval—oligomenorrhœa, (3) normal amount, prolonged interval—opsomenorrhœa, (4) scanty amount, prolonged interval—oligo opsomenorrhœa.

As to the time of its inception: (a) at puberty, (b) after a period of more or less normal menstruation.

INDICATIONS

The form of ovarian hypofunction suitable for this therapy may manifest itself as any one

TABLE II—SUCCESSFUL CASES

No	Age	P a	Interval between last menstruation and treatment 31 mths	Interval between treatment and result Weeks	Comment
			9	3	Regular Red t n an wr ght
2	27		8	0	Regular for 8 m s P g nacy—norm l b th
4	4		4	4	Am nter l r s m p r o t m a r a g e R g u l a r f r o m P g nacy
6	27		4	4	Regular for mo P g nacy
	34	1	12	4	Regular Weighed 0 lb R d c t n
11	30		3	8	Regular P f s
15	27		4	4	Regular P g nacy—pr m tur b th
16	33		8	6	Regular 1 w sep f i s p e r e t
7	3		3	4	Regular P g nacy—b th no m l
18	16	0	6	4	Regular
20	9	0	3	4	Regular
	30	0	16	7	Regular but ac ty
	8	0	18	4	Regular
24	28	0	4	4	Regular
25	6		3	4	Regular P g nacy (term t ed)
6	37	0	72	4	Regular—3 d ys fo e pe d
27		0	6	7	Regular
9	6	1		3	Regular—3 d ys f day m es
3	5	0		2	Regular (4 m m n es l
33	24	0	7	7	Regular R d d w ight 47 lbs
34	31	0	34	2	Regular—3 d ys fo e Ch sed from r day to 4 day type
35	26	0	7	7	Regular P g nacy (term t ed)
36	3			4	Regular (P ou tr v l y m s l)
37	3		✓	3	Regular Ch g d from / day t 3 d y typ
38	33			5	Regular (Pr ou n t 34 m) Ch ag ed t 4 d y type

followed (after irradiation) by a menstruation was 6 years. A successful result was obtained

in a woman of 30 years (Case 21), who had not menstruated for 3 years. In Case 34, an obese woman with a small undeveloped uterus a narrow pelvis, and sexual anaesthesia, the menses changed from a one day watery flow to a normal 4 day menstruation and she lost 30 pounds. Though in some of the cases, the menstrual cycles did not persist the prompt reaction following the radiation was a striking evidence that the treatment is effective if a functioning vestige of the ovary remains. Thus in a woman of 37 who had not menstruated for 6 years, only one menstruation period followed the treatment. The regulating effect is apparent in Case 38. This woman aged 33 gave a history of amenorrhoea for 5 years after childbirth. She had menstruated 4 months before treatment and then 1 month before the treatment when the flow lasted for 12 days. Following the treatment there has been regular 4 to 5 day menstruation every month.

The interval between the first radiation and the menstruation varied but in the majority of cases it was about 28 days. In two cases the duration was 2 and 3 weeks. It was not less than 2 weeks. In 4 cases menstruation appeared 7 weeks after the treatment. In Case 2 it appeared 10 weeks after treatment and after 8 regular periods this patient became pregnant. In Case 16 a sterile woman of 35 it appeared 16 weeks after a second partial dose had been given, the first dose 3 months before having failed to produce results.

In some of these cases simultaneously with the regulation of menstruation dysmenorrhoeic symptoms were favorably influenced. In other cases there was no improvement of the dysmenorrhoea in spite of improvement of menstrual function. In some cases the pain with the first menstruation was extremely severe.

In some cases of oligomenorrhoea the increase of the menstrual function was abnormal. In certain cases of hypomenorrhoea in which there was a marked adiposity with the menstrual disturbance the adiposity was reduced after the onset of menstruation without any other therapeutic measure. One of these patients lost 13 pounds after treatment, one 47 pounds and one 60 pounds.

PREGNANCY

Besides this there are 8 cases treated for hypomenorrhœa in whom following regular menstrual periods, pregnancy ensued¹

All of these patients previously had shown symptoms of a defective ovarian function. Before pregnancy there was a period during

TABLE III—PREGNANCIES†

In primipara	5
In 1 para	1
In 2 para	2
Total	7
Premature by 10 (due to nephritis)	1
Normal termination	4
Unborn noted	4

No	Age	Married	Para	Interval between last menstruation and treatment Months	Interval between irradiation and result Weeks	Notes
1	27	5	0	9	10	Menstruation for 8 mos Pregnancy Normal birth
4	24	4	0	4	4	Had ceased for 18 mos prior to marriage Pregnant after 10 menstruations Normal birth
6	21	3	1	4	4	Pregnant after 2 menstruations Normal birth
15	27	5	0	4	4	Pregnant after 3 menstruations Premature infant nephritis September 1925—pregnant again
17	30	8	11	3	4	Pregnant after 2 normal menstruations Normal birth
25	26	7-12	0	5†	4	Pregnant after 7 normal menstruations Now pregnant
35	26	5	0	7	7	Pregnant after 12 normal menstruations Now pregnant

Stillbirth, 9 4 5 mos

† 9 2 3 mos

‡ Since this report was submitted Case 187, 26 years old, reported her self as pregnant after three normal menstruations

¹Linzenmeier reported the cases of a woman who, some time after irradiation of the ovaries (in 1 case for fibroma and in the other for menorrhagia) became pregnant and were delivered of normal infants at term. In the first case the woman received two irradiations over the right abdomen. In the second case irradiations were given abdominally and dorsally. The pregnancy occurred a year later. In both cases weak dosage had been used. Neither of the women previously had had children although both had been married for several years. Linzenmeier in 8 cases (as reported in the literature) of pregnancy following irradiation found a malformation of the child in only 1 case.

which the menstruation became regular. The ages were 21, 24, 26, (3) 27, (2) 30. Premature birth occurred in 1 case. One of the patients was a 1 para and one a 11 para, and 6 others had never been pregnant before. Two patients, Cases 18, 25 and 35, are now pregnant. Of 5 births there were 4 healthy normal living children.

Failures The treatment failed to achieve the desired result in 13 cases. Analysis of these cases is of great interest since it aids in defining the limitation of this treatment. A study of these cases would indicate that the failure of the treatment may be the result of one or a combination of several conditions.

Premature menopause In 2 cases the age was 36 years. One of these patients, Case 10, had menstruated 12 times in the last 18 years, her last menstruation having taken place 6 years before treatment, and the other, Case 3, had menstruated 3 times in the last 5 years, the last flow having taken place 4 months before treatment.

Developmental deficiency One patient, Case 8, had at the age of 24 menstruated only twice, once at 6 and once at 16 years, and had stained once 4 months after marriage. There was a history of flushes. The left ovary was not palpable and the right was small and hard. A small sella turcica was present in this case. There was sexual anesthesia. This would indicate a very marked congenital maldevelopment of the genital tract with ovarian deficiency. In this category may also be placed the cases of oligomenorrhœa, Cases 7, 9, 14, 19, and 31, in which menstruation was markedly irregular from the first and various uterine and ovarian stigmata indicated undeveloped or degenerated sex organs.

Pelvic infection In Case 23 the patient was 30 years old. Her condition remained unchanged after treatment. She spotted for a few hours for one day. Her irregularity began after a miscarriage 7 years ago. In this case and in Case 5, the cause of failure was probably an old pelvic infection. In Case 28, the oligomenorrhœa dated from the last childbirth. As a result of the treatment, she had at the next period severe cramps for 3 days, but the watery discharge for 1 day was the same as usual.

TABLE IV — FAILURES

No	Age	Para	History	Remarks
3	36	11	Mens s irregular Th ctim sing years	Pa lare due to age Pr bably premat re me opa e
5	7	0	N ne for 3 months	I soffic entt eatment I inflammatory procesa n pelvis
7	27	0	Alw ys regular Last men mo th ag	Atrophic cystic degener erat nol the ovaries
8	4	0	O e at 6 On e at 36 Stain d nc 4 month afte mar r ge il d d hes f some t m S lanasthes	Co ge talow run de fic cy Literus am lland otro rs ed Left v ry n t p lable Tred d a thermy
9	9	0	Always equal and re singly so	Ameh hwa year
0	36		s t n e last 9 ye r Had dush s met me go Last m truat dy befo treatm t	Ove s not p lable D k kin llypet d v l Def t e erat g ns
1	31	1	Always gula Last men truat t m 8 m gth befo tee t ment	t se of f lare k w
4	6	0	Alw ys r g l at La m n t u i n s m ths go	Conx t l ova a de fecency
9	8	0	Alw ys r g l at La m n t u i n s m ths go	Co ge t l i r e n
3	0	0	St d f r l a t r y e w th p	N h nge s m asbe l r t tment f l c t foll w x m carr g 7 yea g
8		0	l a l f s d m th fib d tetu	Camps h l t Ca probab beg n fbro is
30	3		F t l ty M st u t n egula	Sm llyp plastic t r S x l asth sa
31	3	0	Alw ys r gul L m t att m ths go	Pr bly cystol y

In Case 30 treatment was instituted for sterility, menstruation being normal

It is perhaps of interest to state that the very close observation and analysis of the physical condition in these cases disclosed no rejuvenation effects nor were there any changes as regards libido Effects as described by Steinach and Fraenkel could not be observed in the cases studied

MODE OF ACTION

The mechanism by which the radiation produced the desirable effects is a difficult problem In the consideration of this question, it is perhaps important to understand that the

TABLE V — ANALYSIS OF RESULTS IN THE FAILURES

Area	Cases
16 to 30	1
31 to 35	5
36 to 40	1
31 to 35	4
36 to 40	2
Total number of cases	13
F l u r s d u e t p r e m t r o m p e (?) (C a s 3 4 d r j	1
F a l e a d e t o c n g t a l d f e c u y o l g n a l t r a c t d e v e l o p -	1
m e t l c s y 3 8 0 3 3 3 3 5	6
F l u r e d e t o u k n w c a u s (C a s 3 3 a n d 3 5)	2
F a l r e s t e t o p o u s p e l c l f e e t (C a s 5 2 3 n d 3 8)	1

histological changes indicate no such difference in the sensitivity of the various ovarian cellular structures as would permit us to reason that a specific effect has occurred in any particular part of the ovary Even with the relatively small dosage administered the ovarian follicular structure in all stages of development the structures of the cortex and medulla were similarly affected The effect may be produced through action¹ on the (1) corpus follicularis (ruptured follicle), (2) graafian follicle (unruptured) (3) ovarian stroma (hormonal action) and (4) uterine mucosa

The effect of radiation on the corpus follicularis Though the relation of the cause and effect between follicular rupture and uterine changes have not been established beyond all doubt it is generally conceded that the corpus follicularis from the moment of its rupture, if not before, is a chemically active body until its period of involution or absorption² The

Cell s s t d d t h e e f f e c t o f m i d i r a d i a t n o l t h e o v a r e s n a b b t
As compared with the vary of the content of the ovary of the radiation
as m l u s u a l l y s h o w e d g e r a t i o n o f t h e l l c l a r p a r t s w h a s
e n a b l e g a t i t a t i y b u t n e q u a l i t y f o m t h o c c u r n g
and r e m a i n p h y s i o l o g i c a l d i o The f i r s t g o a d g e l u
o c c u r r a b l e y e a r t h v o u m L a t e r t h g r a n u l o s c e l l s w h c g e s T h e
o f t h e p r e m a r r y f o l l i c l s h o w e d d e g e n e r a t i o n a n d o n t r o n
c e l l s i n t h c l e a r s w h c h a t t a r s u r d a b a p e a n d w g t i g u l a
b r o m a t e d b t o n i s c c u s i o n l y d a r k e m o r e l e n t a t y s t m e d
d f i l l y d a p p e a r s m p l i y The f l a t e p i t h e l a l c e l l s o f s u c h f i
l l e v a t p h y a d e v e t a l l y b e c m d e t a c h e d T h o a f t e r l a r g e r
l l e l s t o t h e u n d e s h a p e t h f i e n e l k p r o t a m s i n m o e
i n t e l y w t h e o n b e c m t r y s a d o l t n o c t r a c t a w a y f o m
t h o n a p e l l c e d w h c h f l y d g e a r s b q e t h t h e g g c e l l
c h a n g e t a s h o r n r e c u r o u s b r a i c l l i b u t h l t h e n c e l l c h n g s
a t h e s m t h l y o u n g e r T h g b o s a l o f t h e l a r g e r l l e s
d g e e r a t T h e r l a e t g f o t t h d g e e r a t d e g r a s c a c c l s i n t o
t h m t s t v a n o l u c o y c t d a w e l l g f t h e c t h e r l e r a
T h e r f o l l w t h c o n t c o n o f t h f l l u c u l a r c a v i t y r e s i s t
d g e e r a t o f t h f o l l i c l e

Ac c u n g t o L o e b t h r e a r e t w o f a c t o r i n t h e s e x u a l c y c l e T h
f i a t c e t r i s o a t d d w i t h t h o a r w t h t h e c o r
p l a t e u m T h w a l l o f t h e r o m f o l l i c l e s e c r e t e s a s u b t r o n g
w h c u s e e c h i s t o r y c h n g s g r o w t h p r o c s c r a i n p h y s i c a l
a l t e a t s e n d o i l s i n t h e m m a r r y d e a g n s u t e r n e
w h a d i m a r r y p o s s i b l g r o w t h e n g e s i n t h o r y
t e l l c m a n g i n g v e l t w h l d y s t o c y o r u s a t u r f a t i o n s
T h e s d f a c t o i n t h e u n c y c l e a c c o n t r l d b y s b a t c e s s e r e d
b y t h c u s u l t e u m T h e s c e t a s s e n t u e t e r m a k e p o s s i b l e
t h e f o m t o n o f d e c i d u p r e d c l p o l i d e n t a n d d i s c u l t a t e
t h e f i n a t o a n d d e l o p m t o t h l t h e o v a r i u m T h e y p r e v e t r o m
c r a m o r t r a u m d o v o l u t i o n T h e r e a n t e r m e d i t o r a d g e a t
t e t e g b e t w n t h e f i n a t s c d f a c t o

corpus follicularis exerts its local influence as a regenerative mechanism governing the chemical metabolic processes and the physical pressure relationships in the ovary so that through it the growth and ripening of the remaining follicles are influenced. It may be conceived as being a sort of inhibiting body only through the involution of which the remaining follicular apparatus can return to full function. The continued growth of the corpus follicularis during pregnancy may exercise an inhibitory effect on the ripening of the follicles during this period and on the catabolic regression of anabolic phenomena of this fertile sex cycle. Should the corpus be destroyed or removed through extraneous influences, the attachment of the ovum to the wall of the uterus fails.

Aschoff has shown that the ovum leaves the follicle without a trace of hæmorrhage, and that the follicle grows and reaches its greatest development in about 14 days after ovulation, but that only coincidentally with the uterine bleeding does the characteristic hæmorrhage take place in the follicle which initiates its degeneration. He has shown that this hæmorrhage comes from the rich capillary system of the layer of granulosa lutein cells. The inhibitory function ceases when the regressive changes initiated by the hæmorrhage are well advanced, toward the end of the third stage, or 14 days after the hæmorrhage has taken place into the follicle. And then another follicle ruptures.

It is therefore obvious that if the menstrual hæmorrhage should not take place in the follicle, because of, let us say, a defective formation of the capillary system in the layer of granulosa lutein cells, or even if the hæmorrhage does occur, should the chemical changes which produce the marked degeneration of the lutein cells not take place, the follicle will follow the course of the corpus luteum of pregnancy. It remains in the blossoming state, at the height of its lutein secretory activity. The retrogression of the follicle is delayed. An inhibitory effect is exercised on further follicle rupture, and ovulation and uterine menstruation are absent.

The action of the radiation may be to produce degenerative changes in the corpus luteum which in 14 days will result in sufficient

involution of the corpus to permit a new ovulation and the concomitant premenstrual swelling of the uterine mucous membrane which in 14 days after ovulation will result in menstruation. Thus, the whole cycle of changes would take place in 28 days. In the majority of cases menstruation followed the treatment in 28 to 30 days. This result is quite in accord with the changes produced by radiation on tissues in general. The endothelium of the finer blood vessels is extremely sensitive to the radiation. Occlusion of the smaller vessels with anemic infarction is one of the first changes to be noted and the highly vascular capillary system of the layer of granulosa lutein cells could be thus quickly affected.¹

The effect of radiation on the graafian follicle. If as a result of intrinsic or extrinsic causes,² the new follicular rupture is delayed³ or does not occur at all in spite of the fact that the degeneration of the last corpus follicularis so necessary to menstruation has taken place it is conceivable that the irradiation may aid the rupture of a mature graafian follicle or produce changes biologically equivalent to a rupture. The irradiation which produces this result must however at the same time injure the ovum which undoubtedly dies, for the difference in sensitivity cannot be so great that the expelled ovum would be left unaffected. As a result of such changes, the premenstrual uterine phenomena are incited. Frank states that at the time of follicular rupture, a concentrated active extract (the follicle fluid) is poured out and is rapidly absorbed by the lymphatics. The granulosa of the follicle at this time has no connection with the blood stream, but immediately after ovulation, capillaries penetrate the ruptured follicle and within a few hours the process of vascularization places each secreting cell in intimate contact with one or more capillaries.

The process once started, the corpus follicularis undergoes its degenerative changes and

¹ Rothenberg has shown that premature hyalinization of the vascular supply of the corpus luteum impedes the recession of the corpus follicularis. The detritus of the lutein cells is not completely and promptly removed.

² In approaching the peritoneal epithelium through which the rupture occurs the follicle must push aside or disintegrate the connective tissue of the tunica albuginea. Ordinarily this is a weak layer, but in some cases it is more highly developed and it has been suggested that it may act as an obstruction to ovulation.

³ Such cases may have periods of metrorrhagia or menorrhagia with a history of amenorrhoea.

the cycle is continued. Under these circumstances, the menstruation should take place at the end of 14 to 15 days after treatment. This it does in some cases.

The effect of radiation may be the result of hormone production from the ovarian stroma or from other pelvic structures.

Through the action of the radiation on the ovarian stroma (interstitial cells) a hormone may be released which directly or indirectly through action on other glands of internal secretion controls ovulation and pregravid changes in the sex organs.

It is claimed that these interstitial cells are normally found within the stroma of the cortex. They resemble lutein cells but are smaller. They have been compared to the interstitial cells of Lydig. They are not homologous according to Jaffe and Marine and are believed to contain secreting granules. They are apparently derived from the theca interna of the atresic follicles.

Steinach and Holzknecht irradiated the ovaries of young guinea pigs and found on histological examination an accelerated destruction of the ova with atresia of the follicles and with this more or less complete atrophy of the follicles both young and mature. There was an associated proliferation of the cells of the theca interna called by them the interstitial cells. Associated with these histological changes there was not an atrophy but a marked hypertrophy of the uterus and acceleration of the development of the sex markings. It was held by them that these uterine changes were evidently the result of hormonal irritation from the markedly proliferated interstitial cells as well as from the direct effect on the uterine tissue.

Geller however irradiated rabbits with moderate dosage and observed no alterations in the secondary sex characters. Likewise the hypophysis showed no histological changes referable to the treatment.

If the proliferation of the so called interstitial cells does take place it is an extremely transitory phenomena for degeneration rapidly follows if the ovary is left *in situ*.

A theory has been expressed that the protein products resulting from the breaking down of the lymphatic tissues of the pelvis may act

as an activating agent to the female sex hormone (Frank) present at times in the circulating blood.

Sippel transplanted the ovarian fragments from other women into the abdomens of sterile women with insufficient menstruation and with amenorrhoea. All began to menstruate regularly and three of them conceived. Such a graft stimulates the hypofunctioning ovaries to activity.

There is a close interrelationship between action of the thyroid, thymus, adrenals, hypophysis and the ovary. In fact substances released for instance by radiation of any part of the body can effectually influence the sexual organs as shown by the experiments of Poos. Genital hormones may be influenced by radiation of the spleen, or the lymph tissue of the parotid gland (Amreich). Spiethoff having observed a return of menstruation when the spleen was irradiated for cutaneous affection applied the X ray over the spleen in patients suffering from amenorrhoea and reports several successes. He sees no other explanation of this result except that of intervention of a splenic hormone in ovarian action. A small dose of radiation applied to the thyroid in hyperthyroidism with amenorrhoea will produce menstruation. On the other hand, Holbauer believes the follicular liquid when the follicle bursts produces pituitary changes, acting as a sensitizer—an activator. He points out that modifications of the genital apparatus from other sources have their influence through the pituitary gland. An example of this is the pituitary hypertrophy in pregnancy which is due to parenteral absorption of heterogenous albumins which may be to some extent of placental origin because hypertrophy is experimentally produced also by injection of placental extract and of peptone. It is also produced by the injection of ovarian extracts. Moreover he regards the anterior pituitary and the hypothalamus as intimately concerned in the mechanism of ovulation and as possessing a controlling importance in regard to menstruation because he has observed suppression of ovulation in animals when the anterior pituitary lobe was removed and its precipitation by injections of pituitary extracts. The climacteric symptoms after roentgen castration may

be alleviated by irradiation of the hypophysis (Borak)

The effect of radiation on the uterine mucosa
In the causation of hypomenorrhœa, the ovary is not alone. The uterus may also play a part. Thus even with a normal ovum and corpus luteum, though the periodicity of the ovarian function is maintained, there may be menstrual deficiency if the uterus is small or defective in development.

It is essential that the mucosa lining the uterus be anatomically capable of responding to impulses arising from the ovary. It is conceivable that if the uterine mucosa is not in such a state the radiation may induce such changes directly. Congestion of the endometrium can be demonstrated after irradiation. This cannot be entirely ruled out as a contributing factor in the production of the results.

SUMMARY

The results of radiation treatment led to the conclusion that a certain dosage in carefully selected cases is capable of producing improvement in ovarian function as shown by the regulation of the menstruation and the induction of pregnancy with the birth of healthy children.

There cannot be any objection to this form of treatment on grounds that the already diminished ovarian activity can still further be diminished by the small doses of radiation. If the condition of the ovary is such that this

should actually take place, nothing is lost for such an ovary is incompetent to produce the menstrual mechanism or to produce an ovum capable of fecundation.

REFERENCES

- ANDREICH Zentralbl f Gynaek 1921 xli
ASCHOFF Lectures on Pathology New York Paul B Hoeber 1924
CHENINSE Presse med 192 xxx 977
FLATAU Zentralbl f Gynaek 19 2, 11
FRAENKEL M Zentralbl f Gynaek 1914 xxvi 19 xl October
FRANK and CLEWSON J Am M As 1923, lxxxiv, 1713
HALBAN and KOFHLEP Arch f Gynaek 1914 xxvi
HALBERSTADTER and SIMONS Fortschr a d Geb d Roentgenstrahlen xxviii
HOLBAUER Zentralbl f Gynaek 1924 No 3
HOLZNECHT Zentralbl f Gynaek xli, Muenchen med Wchn chr 19 1 xxxvii
JAFFE and MARINE J Exper Med 1923, July
KAZNELSON and LORANT Muenchen med Wchnchr 1921 No 3
LENZENMEIER Zentralbl f Gynaek 19 2 No 9
MARTINI 17, Versamm d deutsch f Ge ell ch f Gynaek 19 2
MOXER Med Klin 1920 No 26
NEVAL and GRAFF Zt chr f Geburtsh u Gynaek 19 lxxii
ORITZ Strahl ntherapie Grong Gedenkbund
RODENBURG and HELLMAN New York State M J xxv 713
RONGY Am J Obst & Gynec 1923 xv June
SCHICKELE Gynec et obst 1923 xii
SCHRODER Monatschr f Geburtsh u Gynaek 1920 li
SEITZ Zentralbl f Gynaek 19 No 2
SEITZ and WENTZ Monat schr f Geburt h u Gynaek 1919 xli
SIPPL Zentralbl f Gynaek 19 4 No 1
SPIETHOFF Muenchen med Wchnchr 19 4 lxxi 743
THALER 17 Versamm d deut ch f Gesellschaft f Gynaek 1922
VAN DE VELDE Zentralbl f Gynaek 1913 No 19

CLINICAL SURGERY

FROM THE CLINIC OF THE INDUSTRIAL HOSPITAL OF SERPOUHOFF

ILIO-ABDOMINAL AMPUTATION IN A CASE OF SARCOMA, RECOVERY PREGNANCY AND BIRTH OF LIVING CHILD

BY SERGEY S. JUDIN, SERPOUHOFF, UNITED STATES OF SOVIET RUSSIA
Surgeon of the Industrial Hospital of Serpouhoff

IT IS now more than 37 years since Billroth performed the first operation to remove half of the pelvis together with the lower limb and yet the number of reported cases is still very small. As the accompanying table shows, so far only about 70 cases have been reported. A study of this table will readily reveal why the operation is seldom done in surgical practice. The mortality is so great and the end results so poor that we question whether the operation should be performed or be classed with such operations as the radical removal of cancer of the lower part of the oesophagus. Our case, however, is proof that in some instances at least the operation may give very good results.

ANÆSTHESIA

For such an extensive operation, local anæsthesia is hardly feasible. General anæsthesia has been used in most of the reported cases, but it is true that it does not hold the last place in the list of causes of death. The idea of using spinal anæsthesia, I think, should be credited to Bier, who used it in his case. Since then many others have used it; in our review we find that spinal anæsthesia was used in 8 cases. From my own experience and as shown in the reports of others, I believe that it is the best method in these cases. Trauma is so great and so much tissue is cut asunder that a most profound nerve block is necessary to prevent dangerous shock. During the entire operation the patient must be kept deeply narcotized and it would be impossible to do this if general anæsthesia were used because the operation requires so much time. Spinal anæ-

sthesia does not have a bad effect on the general condition of the patient but it does produce a satisfactory nerve block and it removes the possibility of shock.

THE EXTENT AND CHARACTER OF THE TRAUMA

Disarticulation of the bony pelvic ring is done in front through the symphysis and in the back through the sacro iliac synchondrosis. These points of separation, however, are not definitely fixed. It is not absolutely necessary to cut asunder the cartilage of the symphysis because if the swelling has reached this point the patient should not be operated upon as the urinary bladder is so close by. If the swelling has not reached this point it is better to file the bone laterally and care should be used not to injure the place of insertion of the rectus abdominis muscle and the corpora cavernosa of the penis or clitoris which if cut may cause a very unpleasant hæmorrhage. One must not separate the ilium from the sacrum at the back unless there is special need to do so. If the swelling has reached the synchondrosis, it is impossible to reach the large blood vessels for preliminary ligation because the common iliac artery divides just on a level with the synchondrosis. If the large vessels cannot be ligated it is impossible to operate. But if in the preliminary ligation of the vessels we find that the swelling has not reached the edge of the sacrum, instead of severing the pelvis in the synchondrosis it is necessary to file with a wire file the ilium from the sciatic notch upward, parallel to the edge of the sacrum and at a distance from the latter of 1.5 to 2 centi-

meters We thus diminish the trauma greatly, which is essential We must not use hammer or chisel but a wire file

The second great step in the operation is the cutting of the sacral nerve plexus Only a complete nerve block will prevent shock at the moment when the stem or roots of the great sciatic nerve are cut, and for that part of the operation many authors demand deep narcosis Sometimes even this is not enough and the patients react badly when the section is made I will cite a few instances from unpublished cases Dr V Rosanov's first patient suffered a severe shock with falling of the pulse at this stage of the operation An injection of four syringes of camphorated oil improved the pulse enough to continue the operation, but the condition of shock returned during section of the nerves and the patient died 6 hours after the operation in spite of different means of stimulation Dr V Krassintzev in operating upon his fourth case under general anesthesia observed shock the moment the sacral nerve plexus was cut and in spite of every means to stimulate the patient, death occurred 5 hours after operation

To prevent such possibilities the injection of a solution of cocaine or novocain into the open severed roots above the line of incision is recommended It is not difficult to do this during operation, and of course it should be done Great hopes were laid that with the use of spinal anesthesia the block of the roots inside the cerebral membrane would remove the reflex during the cutting of nerves on the periphery Theoretically this result is obviously possible but in practice it does not work out so satisfactorily Dr G Kokin in operating upon his patients under spinal anesthesia (tropocain 0.10), as a further precaution did not inject the anesthetic solution into the bared roots As a result immediately after cutting the sciatic nerve the patient, who until this time felt very well, suffered a severe shock The pulse was almost imperceptible and although, thanks to the different stimulating injections, the operation could be finished, it was impossible to improve the pulse, and the patient died in 18 hours In his fifth case Dr Krassintzev operating under spinal anesthesia, injected into the bared roots before

section 10 per cent novocain and was successful, as the patient continued in good condition

In our case, however, even a double nerve block did not fully remove the reflex We used spinal anesthesia and the anesthesia was ideal Before cutting we injected into each of the large roots 1 cubic centimeter 1 per cent cocaine and after waiting 5 minutes cut the roots, two of them at first and after another 10 minutes, again two Each time we noticed a considerable fall of blood pressure and the pulse became much faster These facts emphasize the importance of producing a complete nerve block in these regions

STEPS TO LESSEN BLOOD LOSS

We must take care to lessen the loss of blood (1) by freeing the limb to be amputated of as much blood as possible before operation, and (2) by preventing as far as possible the loss of blood when the vessels are cut during the operation itself

To deprive the limb of blood before amputation, one may either elevate the leg or may apply an elastic bandage from the periphery to the center Such measures are simple, and there is no reason why they should not be used There is also another way which was proposed by Professor Oppel by which the parts which cannot be bandaged may be deprived of blood If, during the process of operating, we ligate first only one principal leading artery, the vein not ligated will suck out pretty energetically the blood from the limb Thus a considerable quantity of the remaining blood will return to the organism and will be *whole* For example, by temporarily preserving the splenic vein after ligating the splenic artery during removal of the large spleen one can greatly lessen the size of the organ to be removed through cutting off the blood supply These methods have been tried on extremities, for instance, in the Saratov clinic, Professor Razoumovski uses them in doing an amputation at the shoulder (amputation interscapulothoracica) For removal of half of the pelvis with the lower limb, Oppel's principle has been used in the clinic of Professor Mirotvorzev, of Saratov, and its use has been fully justified

We believe that if one ligates first only one external iliac artery, the temporarily remain

ing vein will suck out a sufficient quantity of blood from the limb to be removed. As to the loss of blood from the cut vessels we believe that this is considered by the surgeon the most hazardous part of the operation. The size of the flap is so great and so many vessels are cut that one is fully justified in expecting great loss of blood. The apprehensions have been the means of adopting two heroic preliminary measures: the ligation of the common iliac artery and pressure on the abdominal aorta with an elastic band following Momburg's method.

From the experience of some surgeons who have used the Momburg elastic band one infers that this operation can be done without loss of blood, but this is true doubtless only while the aorta is being pressed by the elastic band. After the band is removed the hemorrhage will depend upon what vessels have been ligated, if we have ligated the common iliac vessels we cannot have great loss of blood as there is no place from which the blood can come—so why use the elastic band? If only the external iliac artery has been ligated the flap which receives its blood from the branches of the hypogastric artery may cause a great flow of blood after the elastic band has been taken off before we can stop it.

It is also a well known fact that placing an elastic band in the region of the aorta provokes a considerable elevation of blood pressure and when the band is removed there is a violent fall in blood pressure which may lead to collapse. The case of Axhausen was an eloquent example of this condition as the pulse of the patient was practically imperceptible immediately after the band was taken off and she died 9 hours after the operation. Altogether we think that in such a major operation as an ilio-abdominal amputation one must be as careful as possible not to throw an extra burden on the patient's heart such as we would do if we used the elastic band over the region supplied by one of the main arteries.

The above mentioned method of ligating the common iliac vessels has been tried several times but there is always the risk of killing the flap. Professor Brzowski, in a report of 26 cases from the literature of operations done by ligating the vessels (general or both the prin-

cipal branches) found that of the patients who survived the first 24 hours, in 5 the necrosis of the flap was noticed and that all 5 patients died. In the last case brought to our attention by Dr. Krassintzev and demonstrated at the surgical society meeting in Moscow in December, 1925 the flap had become partially necrotic after the common iliac vessels were ligated. This necessitated several complementary plastic operations, but the patient happily survived.

And so we have before us the problem of securing a good muscular flap without great loss of blood at the same time keeping the aorta free from pressure and not ligating the hypogastric artery. After removal of half of the pelvis the wounds produced in most cases will be similar—in front the end of the filed os pubis on top, the edges of the oblique abdominal muscle, and at the back the filed piece of the pelvis parallel to the border of the os sacrum—so that it will be necessary in closing the wound to use the exterior back flap of the gluteus. We must include the great gluteus to prevent prolapse of the intestines. We must therefore determine how to make this gluteal flap so that it will be properly nourished and at the same time avoid a great loss of blood.

We start dissecting the flap at the posterior angle of the incision which was made in order to ligate the large blood vessels within the pelvis. Beginning at the symphysis pubis we continue the dissection parallel with Poupart's ligament as far as the anterior superior spine cutting off all the muscles from the crest of the ilium to the edge of the sacrum. From here the flap is cut first parallel to, and including the upper edge of the great gluteal muscle, then downward in a curve toward the greater trochanter. From here we curve again downward and backward toward the gluteal fold. After this it is necessary to dissect the intermuscular tissue and to divide the great and middle gluteal muscles as in them is located the stem and principal branches of both gluteal arteries. It is best to proceed from the great trochanter along the top of the great gluteal muscle. When traction is exerted on this muscle toward the rear we meet a resistance from the front exterior fastening of the muscle to the iliotibial tract. Following the

direction of the skin dissection, we begin to cut away the muscle from the aponeurosis, all the time pushing the flap toward the back and proceeding in the slit between the muscles. The incision must be large enough to allow us to separate the big and middle gluteus muscles and to work between them to the ischiatic opening. When the muscle is cut in front, some ends of the branches of the superior and inferior gluteal arteries get into the slit. These vessels are cut away gradually and bleed but little.

But when the intermuscular space is well opened up, we are masters of the situation in that there is a slight possibility of certain hæmorrhage. Both gluteal arteries come out of the pelvis through the large sciatic opening and divide into two branches by the pyriform muscle. The form and course of this muscle are very characteristic and assist greatly in orientation and establishing the topographical relations of the vessels and nerves. Through the foramen suprapiriformis the superior gluteal artery and nerve emerge from the pelvis, through the lower foramen the lower inferior gluteal artery and nerve, the sciatic nerve, the posterior femoral cutaneous nerve, and the internal pudendal artery. This last has no relation to the flap because emerging through the foramen infrapiriformis it goes back into the pelvis through the lesser sciatic foramen.

All the principal vessels of both the gluteal arteries which concern us branch off the main artery in the muscular slit described. This makes it possible for us to ligate with ease all the principal branches which supply the region which is to be cut off. The superior gluteal artery having a very short stem (0.5 to 1 centimeter long), divides immediately into two branches, the superficial and the deep. The first supplies blood to the large gluteal muscle and to the skin covering it, the second (often double) nourishes the middle and lesser gluteal muscles. The deep branch and one or two branches of the superficial vessels are ligated. The stem itself and the superficial branch are of course well taken care of. Besides, all the lower part of the great gluteal muscle with the skin covering it is supplied by the lower gluteal artery. The latter coming from under the edge of the pyriform muscle

does not divide at the top into branches but for the most part continues as a main stem to the interior surface of the great gluteal muscle, following all the time the mentioned intermuscular slit. Its stem is easily seen during its course and one can easily ligate a few branches leading to the middle gluteal muscle. If the end of the artery has not been cut previously, one must place a ligature on the stem if the point of insertion of the muscle to the thigh bone has not been reached.

After the artery is ligated one may dissect all the great gluteal muscle from the thigh almost without loss of blood. We have now practically finished dissecting the flap which can be retracted so that the whole field of operation in the region of the ischiatic foramen is exposed. The pyriform muscle is cut asunder and the middle gluteal muscle is separated from the bone. Hæmorrhage is secured by ligating the superior gluteal branch. The sacral plexus is bared, anesthetized, and cut. A wire file is placed in the sciatic foramen and the pelvis is filed from bottom to top, parallel to the edge of the sacrum.

As the pelvis in the region of the symphysis has been filed at the beginning of the operation, the entire half of the pelvis becomes movable. We have cut only the thick sacrospinous ligaments and sacrotuberosum, the iliopsoas muscle, and the levator ani. The slitting of the iliopsoas muscle is possible after traction, after which the part to be cut off is held only by the fibers of the muscles at the bottom of the pelvis. These are cut away along their fastening to the pubis and ischium. Only a few branches of the internal pudendal artery are affected if its stem had not been ligated simultaneously with the branches of the gluteal artery on the level with the incisure ischiadice. Before the final detachment of the pelvis, one must remember the obturator artery for if the latter has not been ligated at the beginning of the operation it should be ligated now. Of course we must take care not to involve the obturator nerve in the ligature.

This method was used in our case.

A peasant, aged 36 years, came to the surgical department of our hospital because of swelling in the right groin and pain in the calves and knee. In her

childhood she had always been well. Her family history is negative. She denies lues. The Wassermann was 4 plus. She has had 8 children and 7 of them are still alive. A year previously she had been in another hospital for treatment of typhus exanthematicus and soon after convalescence she noticed for the first time a swelling in her right groin. At the first examination June 6, 1923, a compact tumor was found occupying the right part of the right inguinal region and the top third of the thigh. This swelling was quite immovable and there was no doubt that it was a neoplasm. Because the roentgen cabinet was out of order the patient was requested to return in a fortnight for X-ray examination. She did not come back, however, for 3 months and when she entered the hospital she could not walk on her foot and moved about on crutches. The tumor by this time had increased in size and presented the form of a cone with top down about 25 centimeters below the anterior superior spine and the base was almost on a level with Poupart's ligament. In front the growth had obviously permeated the muscles of the thigh while the back and sides of the thigh were free from the growth. The femoral artery coming from the lacuna vasorum could be well felt for a distance of 4 or 5 centimeters lying straight on the swelling. Lower down it could not be felt on palpation. At the side in the gluteal region over the crest of the ilium and Poupart's ligament enlarged veins were clearly visible under the skin. The whole foot was in the position of adduction and inward rotation and passively kept this forced position.

Roentgenographic examination showed no normal outline of the upper part of the thigh, as the outside of the femur, trochanter muscle and all the upper part of the neck of the thigh were absent. These parts were hidden by the shadows which the swelling produced. The form and length of which could be distinguished on the roentgenogram among the other soft parts of the thigh. One could see that the swelling arising from the great trochanteric muscle and upper part of the neck of the femur extended inward to the head of the femur, destroying the most of it. Of the head there remained only a line in the form of a crescent corresponding to the lower middle segment. The swelling came so near to the lower part of the neck that the bone had broken near the trochanter and a coxa vara had been produced.

Operation was performed October 23, 1923, under spinal anesthesia, 2 cubic centimeters of 5 per cent novocain. During the whole operation the anesthesia was perfect. The patient talked, drank and said she felt no pain whatever. The successive steps of the operation were as follows. An incision was made extending from the symphysis parallel with Poupart's ligament to the anterior superior spine then along the crest of the ilium to the synchondrosis, cutting away all the muscles. With such a large incision it was easy to eviscerate the peritoneum with the ureter and ligate the external iliac artery below the point at which it deviates from the hypogastric artery. Then with a Gigli file we filed the

pelvic ring in front laterally from the symphysis a distance of 1.5 to 2 centimeters. We cut the gluteal flap as described. The pelvis at the back was filed with the Gigli file and the thick sacral ligament dissected. The muscles of the bottom of the pelvis were cut and it was now possible to remove half of the pelvis. The loss of blood during the entire time was very little. The edges of the great gluteal muscle were sewed to the lower ends of the oblique abdominal muscles as well as the muscles at the bottom of the pelvis. The flap covered the whole wound beautifully and the wound was closed without strain upon the sutures. Two rubber drains were placed in the corners.

The after course was uneventful and the wound healed per primam. The patient has a good muscle barrier and no projections are noticed. When in May 1924 I demonstrated at the VII Reunion of Russian Surgeons the patient and the specimen of the removed limb which on histological examination showed chondrosarcoma. I did not know then what a serious test the gluteal flap was destined to have. The fact is that 6 months after the reunion my patient came to be examined and we found that she was pregnant 4 months or more. Of course I was greatly perplexed at the idea of the coming child birth in such unusual conditions—the absence of one half of the bony pelvis and the defect covered with a plastic muscular flap. I consulted many experienced accoucheurs as I wished to know what difficulties were to be expected during the labor. I was told that even in case of a normal presentation of the head as there would be no guiding support from the pelvic ring the head might follow the line of least resistance that is sideways toward the defective side of the pelvis. The child would then either pass into a lateral position or become firmly fixed with the head in the side wall of the uterus in the direction of the operative scar.

Of course these were all theoretic conjectures because not one of the accoucheurs had ever met with practically such a case. I decided to take the patient into my surgical department for delivery with the idea of doing a cesarean section if necessary. The patient timed very accurately the time for delivery and arrived 4 days before time. The roentgenogram showed the head in normal position, the back to the left. The pains began very normally and in a half hour the patient gave birth to a son weighing 4200 grams. The placenta was expelled 30 minutes later. There was no great loss of blood. The puerperium was uneventful and mother and child went home on the seventh day.

I saw the patient last in October 1925. A letter from her later states that she was quite well and has stopped nursing the child. During childbirth and when last examined the operative scar was perfect, the muscle holding tight the abdominal contents not causing her any discomfort. In the roentgenogram we could see a considerable curving of the remaining half of the pelvis at the cost of an extension of the left synchondrosis; the symphysis is not



Fig 1 Photograph of patient after operation

in the middle line but has moved to the left 7 to 10 degrees. The explanation of this is not difficult to find when we consider the unusual circumstances.

The results of operation can best be determined by looking at the tables. Such reviews have been made before (Kulenkampff, Ransohoff). Of late years the Russian authors Venschel and Brojosovski have analyzed the literature in detail, bringing it to date by adding the recent cases. These two authors studied the reports of 43 cases. Brojosovski divided the material into groups according to the character of the illness of the patient, age



Fig 2 Photograph of patient with child

and sex and based the mortality percentages on the length of the time from operation independent of the cause of death. He found that early death in cases of sarcoma occurred in 66.6 per cent, in cases of tuberculosis and osteomyelitis in 50 per cent. The general mortality was 62.8 per cent.

If we do not include the malignant neoplasms about which we do not personally share the opinion of Kocher namely "in the presence of tuberculosis of the pelvis in which such a major operation is indicated even in cases in which the hip is also affected resection of the pelvis can be combined with the resection of the hip joint" even then the results of the operation in cases of sarcoma remain till now overwhelmingly poor. Brjosovski could show only one case, that of Freeman, that could be counted more or less satisfactorily cured, because in the cases of Salischev and Pagenstecher the patients were kept track of for only 2 or 3 months after operation.

To our great sorrow our review darkens the statistics rather than improves them because the last case has been followed for only a short time and our good result and favorable convalescence is offset by the large number of deaths either immediately after operation or as a result of a relapse or metastasis soon after leaving the hospital. But from relapses and metastasis no patient with sarcoma is guaranteed and with the progress which has been shown in the technique of operation—spinal anesthesia, nerve block, the ligation of vessels of the flap on extension—one may perhaps be able to improve the early results and there is no reason to refuse these patients the last, perhaps a desperate, chance to save their lives. I trust that my case will encourage the hesitating

No	Author	Where published	Sex	Age	Cause of operation	Anæsthesia	Duration of operation	Result of operation Notes
25	Snakevitch (1903)	Surgery vol xxvii p 60 (Russian)	M	47	Sarcoma femoris et pelvis			Death in a few hours
26	Krim (Kadun)	Surgery 1913 xxxiv 763 (Russian)	F	27	Sarcoma coxae	Ether	1 h 15 m	Death on the thirteenth day
27	Gallet (1901)	Ann de la soc belge de chir 1901 p 369 Cit by Kulenkampff	M		Tuberculosis			Death in 5 hours
28	Gallet (1901)		F	39	Sarcoma femoris			Death in the evening same day
29	De Ruyter Meyer	Dissertation Leipzig 1902	F	45	Sarcoma coli femoris			Death in an hour
30	Dreist	Deutsche Ztschr f Chr lxxi 34	F	2	Cottus tuberculo is			Convalescence
31	Bier (1903)	Deutsche med Wchnschr 1909 No 1 45	M	45	Sarcoma coxae	Spinal anæsthesia		Elastic band Momburg Death on the table
32	Pagenstecher (1909)	Arch f klin Chr xc 160	F	50	Sarcoma coxae			Elastic band Momburg Convalescence 3 months—all well
33	Hogard Prengel (1899)	Lancet 1909 vol 1 330		10	Tuberculosis coxae			Second operation after disarticulation of the thigh Slow recovery
34	Hogard Prengel (1906)	Ib dem	F		Tuberculosis pelvis			After disarticulation of thigh—E Y A death the same night from collapse
35	Hogard Prengel (1909)	Ibidem	M	18	Sarcoma femoris		50 m	Recid after disarticulation of thigh—E Y A convalescence Death from metastasis in 5 months
36	Axhausen (1910)	Arch f klin Chr xci 338	F	45	Sarcoma femoris	Ether		Elastic band Momburg plastic of free trans plant Crural tibia death in 9 hours
37	Loeffler	Muenchen med Wchnschr cit by Veinshall	M	11	Sarcoma pelvis			Plastic by Axhausen Convalescence followed during 15 months
38	Babcock	Surg Gynec & Obst 1918 xxvi cit by Veinshall						
39	Ransohoff	Ann Surg 1909 1 923	M	45	Sarcoma pelvis	Ether		Death from septic enterocolitis 4 weeks after the operation
40	Ribbera (Madrid 1902)	Cit by Ransohoff			Tuberculosis			Death collapse
41	Ribbera (Madrid 1902)	Luis y Simon Siglo Med 1903 vol v			Tuberculosis			Death on the eighth day
42	Ribbera (Madrid 1902)				Tuberculosis			Death collapse
43	Il Vermeul (1905)	J de Chir Belge vol v p 406 cit by Ransohoff						
44	Veinshall (Finkelstein) 1921 Bakou	New Surg Arch v iii 147 (Russian)	M	25	Sarcoma pelvis	Narcosis	1 h 30 m	Momburg Death in 23 days Parotitis pdeu monia
45	Pringle	Br J Surg 1916 xviii by Veinshall						2 deaths and 3 convalescences
46	Pringle	2 of these cases were cit by Ransohoff						
47	Pringle							
48	Pringle							
49	Pringle							

TABLE I—CONTINUED

N	Author	Where published	Sex	Age	Cause of periton	Anesthesia	Duration of operation	Results of operation
51	Bergman	Reg Med Soc report by Vein hall			(Osteomyelitis of tubercula)			2 d after and 3 c o a lesions
52	Bergman							
53	Bergman							
54	Bergman							
55	Bergman (Atrich)	N. g Arch 1 p 70 (Ru)	F	26	Sarcoma of femur	Ethyl chloroform	2 h 15 m	Coalescent abscess of the thigh
56	Chey	(t by B. k)						
57	Gilbert							
58	I. I. (B. I.)	(t by B. k)	F		Sarcoma			Elastic band of the hand
59	Lesch (197)	Rif. m. m. l. N. pol. l. h. Han. l. Br. v. k. p. 457						Death of the table
60	Krysky	Pr. gl. d. h. de. te. B. l. f. Ch. 19			Sarcoma of femur	S. l. a. s. thesia	2 h 10 m	Death 5 weeks later
61	Sam. n. (N. 9)	(t by B. k) (Ru. l.)	M	31	Tuberculosis of the lung		2 h	Death of the table
62	Top. e. Kr. m. (K.)	Fl. t. l. o. d. M. l. J. o. a. N. p. 44 (R. d.)	M	47	Sarcoma of the femur	Chloroform	2 h	Death of the table
63	R. l. (N. t.)	N. u. s. r. g. y. (R.) o. s. N. 3 p. 174	M	58	Sarcoma of the femur	S. l. i. n. v. s. thesia	2 h 10 m	Coalescent abscess of the thigh with symptoms of delirium and psychosis
64	R. l. (N. t.)	Il. dem	M	49	Sarcoma of the femur	S. l. i. n. v. s. thesia		On the 4th day of the operation the patient suddenly died
65	J. I. S. h. R.	6 m. (i. g. f. Rus. bug. s. p. 602)	F	36	Sarcoma of the femur	S. l. i. n. v. s. thesia	2 h 15 m	Con. l. e. e. Gravid
66	K. k. C. Mos. 10.4	I. r. l. mm. t. n.	F	30	Sarcoma of the femur	S. l. i. n. v. s. thesia	2 h 15 m	Death in 3 h after laparotomy when cuttings were removed
67	Ros. M. to 6	P. r. l. mm. t.	F	37	Tuberculosis of the lung	Ethyl chloroform	2 h 50 m	Death 6 h after operation of the back when cuttings were removed
68	R. v. v. Mos. w. 9.7	P. r. l. mm. t.	M	35	Sarcoma of the femur	S. l. i. n. v. s. thesia	2 h 20 m	Death 3 m after the operation of the back when cuttings were removed
69	Ros. M. to 12.2	P. r. l. mm. t.	M	31	Sarcoma of the femur	S. l. i. n. v. s. thesia	2 h 3 m	Death 4 h after the operation of the back when cuttings were removed
70	K. s. t. k. l. g.	P. r. l. mm. t. n.	M		Sarcoma of the femur	Chloroform		Death in 3 d 3 s
71	K. l. i. g.	P. r. l. mm. t. n.	M		Sarcoma of the femur	Chloroform		Death the 3th day of the operation of the back when cuttings were removed
72	K. l. i. c. g.	P. r. l. mm. t. n.	M		Sarcoma of the femur	Chloroform		Death 1 d 1 y
73	K. M. i. c. w.		M	45	Sarcoma of the femur	Chloroform		Shock when cutting of the pelvis
74	K. s. i. t. e. Mos. w.	M. c. w. b. g. Soc. 13. 9.5	M	43	Chondrosarcoma of the femur	S. l. i. n. v. s. thesia	2 h 50 m	Con. l. e. e.

FROM THE CLINIC OF ALLEN B. KANAVEL AND SUMNER L. KOCH,
HESLEY MEMORIAL HOSPITAL, CHICAGO

THE COVERING OF RAW SURFACES WITH PARTICULAR REFERENCE TO THE HAND¹

By SUMNER L. KOCH, M.D., CHICAGO

THERE are many sound reasons for covering raw surfaces as promptly as possible with normal tissue. From an economic, from a cosmetic, and most important from a functional standpoint, the repair of defects of the superficial tissues must appeal to the surgeon as of primary importance. When the raw surfaces in question involve parts of the body that are subject to constant movement or whose function depends in great part upon their ability to move freely, the avoidance of scar tissue formation becomes even more imperative.

Scar tissue is the natural enemy of freedom of motion. It develops rapidly, it slowly but constantly undergoes contraction, as it contracts it produces tension upon and compression of the sensory nerves of the affected area. The painful sensations resulting constitute another obstacle to the restoration of the desired freedom of motion.

In determining what method should be applied in covering a given raw surface, two factors are of primary importance: the structures which constitute the raw surface, and the presence or absence of infection. If the raw surface is formed in part by tendons, bone, joints or by important nerves and blood vessels, a full thickness graft with at least a thin layer of subcutaneous tissue is essential to afford adequate protection of the underlying structures and to prevent the formation of adhesions between structures that should be free to move independently of one another. In the presence of infection, however slight, only a thin graft (Thiersch) or a pedicled flap can be used with assurance of success.

In addition to these primary considerations other factors should be mentioned. The size of the defect is not in itself an indication for any particular type of graft. Large surfaces can be successfully covered with a free thick graft. One is limited rather by the amount of available tissue than by the size of the defect. The location of

the raw surface is important. Grafts to replace defects about the face and forehead should be thick enough to restore the original contour or they may become ugly deformities. The contour of the raw surface must be taken into consideration. Folds and depressions such as in the axilla or about the neck, are difficult to cover because it is difficult to maintain accurate apposition between the graft and the raw surface. The mobility of the raw surface or the absence of a firm base may prevent the application of sufficient constant pressure to permit the successful use of a free thick graft. Lack of normal tissue in the neighboring area may prevent one from swinging a pedicled flap from the most convenient location and necessitate the use of flaps with long pedicles taken at a distance.

In covering defects of the hand, the use of thick grafts is essential if one would avoid subsequent contraction. Pedicled flaps give the most certain assurance of success, and permit the utilization of subcutaneous tissue. If subcutaneous tissue is still present after resection of the scar tissue, and this happens not uncommonly after the removal of contracted palmar scars, one may use a free thick graft and secure an entirely satisfactory result.

PREPARATION OF THE PATIENT

The patient's general condition is of great importance. One cannot expect healing of a graft in a patient who is septic and losing weight. A high fluid intake, nutritious food, sunshine, fresh air, the quartz light can all be utilized in getting the patient into the best possible physical condition. The effect of daily exposure to the quartz light, for example, on children suffering from badly infected, extensive burns is often surprising.

If the raw surface is infected every effort should be made to render it as nearly surgically clean as possible. We know of no better method of accomplishing this than by irrigating the wound every 2 hours with properly prepared Dakin's solution.² When no organisms or only a few can

¹ Davis (1) suggests that the term thin graft be used to designate Thiersch grafts and the true Re-ardin graft and the term thick grafts. He distinguishes between a graft which is a mass of tissue cut free from its source and transplanted to a new location and a flap which is attached at some portion of its periphery to its original location.

² A solution which contains 0.45-5 per cent sodium hypochlorite which shows no color reaction with powdered phenolphthalein and which shows only a momentary flash of pink on the addition of alcoholic solution of phenolphthalein.



Fig 1 Repair of an ectropion of the upper lip by means of an Esser epithelial inlay

be found in stained smears from different parts of the wound thin grafts may be applied with reasonable assurance of success.

If the part to be grafted is covered with scar tissue it should be cleansed with warm soapy water on several successive days before operation. If a hand it should be shaved the nails should be manicured and every effort made to free it from bacteria and dead epithelium.

THIN GRAFTS (OLLIER THIERSCII GRAFTS)

The great advantage of the thin graft lies in the fact that it can be successfully applied over a granulating surface its disadvantage is that it undergoes contraction and becomes firmly fixed to the underlying tissues. In spite of this disadvantage thin grafts may often be advantageously used to hasten the healing process in the presence of extensive defects and prevent long continued suppuration and excessive scar tissue formation even though subsequent plastic operations with thick grafts may be necessary later. Blair (2) has emphasized this fact with reference to the covering of raw surfaces resulting from burns about the neck and axilla and Lyle (3)



Fig 2 Free thick graft over raw surface due to a punch wound of index finger 24 hours before. The flexor tendon sheath and two distal phalanges were exposed and the distal interphalangeal joint opened at the time of injury. Left after removal of dressing right final result.

with reference to raw surfaces resulting from injury of the hands.

Thin grafts are usually secured from the outer and anterior aspect of the thigh or from the arm. If the graft is to be free from hair, the inner aspect of the arm should be used. The site from which the graft is taken is carefully washed with soap and water and alcohol. We do not use iodine in the preparation of the skin from which a thin graft is taken.

Excessive granulations are shaved with a sharp knife from the raw surface to be covered and pressure is maintained over it until oozing has stopped. The graft is carefully teased out with needles so that no epithelial surface is turned under and the raw surface is covered as completely as possible with as many strips of epithelium as necessary. Occasionally grafts are sutured in place with a few horsehair sutures but ordinarily we depend upon the dressing to hold the graft in place.

When the raw surface is covered, a single layer of muslin bandage impregnated with sterile vaseline containing 3 per cent of xeroform (bismuth tribromphenate) is laid smoothly over the grafts. Four or five thicknesses of gauze are laid over this and over the gauze marine sponges which have been soaked in 1:1000 mercuric chloride rinsed in sterile water, and wrung dry. A firm pressure bandage binds the sponges in place and maintains an even pressure over the entire surface. When the raw surface covered is small, two layers of gauze are placed over the vaseline gauze, and dental impression compound which has been carefully washed with green soap and softened in hot water is held firmly over the dry gauze until the compound is molded to the underlying surface and has become hard. The dressing is held firmly in place with strips of adhesive tape.

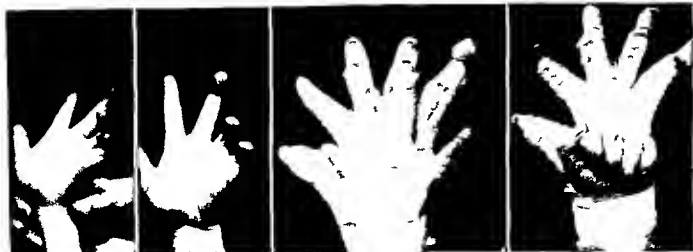


Fig 3 Free thick graft on palmar surface of fourth and fifth fingers. A small portion of the graft on the fifth finger became necrotic without impairing the ultimate result.

The primary dressing is left untouched for from 5 to 7 days. If the grafts are somewhat macerated at this time and considerable wound secretion is present, dressings are changed daily thereafter and sponge pressure reapplied with each dressing. If the grafts are dry, dressings are changed every third day thereafter, and the pressure and dressing completely removed after from 14 to 16 days.

We have had almost uniformly perfect results with this method in covering fresh raw surfaces, such as are left, for example, after raising a pedicled flap. After covering granulating surfaces with thin grafts, infection has developed in a certain percentage of cases. This has been controlled rapidly in most cases by covering the wound with gauze saturated with Dakin's solution or cold boric solution, reapplying sponge pressure and changing the dressing daily. At the change of dressing, before removing it the gauze is again saturated with Dakin's or boric to prevent its adhering to the underlying grafts.

No method which we have used in the past—open air dressing, gutta percha strips, waxed or paraffin gauze—has given as uniformly successful results as the type of dressing described. We have come to believe with Blair and others, that accurately applied uniform pressure maintained for from 14 to 16 days is the most important factor in the successful after-care of skin grafts.

A more limited field of usefulness for the application of Thiersch grafts is the buried graft or epithelial inlay, according to the method suggested by Esser. This is of particular value in covering surfaces which should be separated but which by reason of folds or angles and close proximity, tend to become adherent to one

another. Wounds at the bucco-alveolar junction and about the orbit in particular can often be effectively covered by means of an epithelial inlay (Fig 1). In preparing an inlay, an accurate model of the cavity is made with softened dental impression compound. A Thiersch graft with the raw surface out is wrapped about the hardened model. A few horsehair sutures may help to hold it in place. The model with the surrounding graft is laid in the cavity, and the edges of the defect sutured temporarily to help maintain pressure. At the end of from 10 to 14 days, the sutures are removed, the sutured edges separated, and the impression compound lifted out. The cavity will then be found to be lined with epithelium.

Lastly, thin grafts may be used as a last resort in covering deep defects if full thickness grafts or pedicled flaps are not available or not indicated. A thin graft may be used to cover healthy bone if thicker grafts are not available and if the location is such that the cosmetic result is not of paramount importance.

FREE FULL THICKNESS GRAFTS

There are a number of definite advantages in the use of free thick grafts. They do not undergo contraction as do thin grafts. They retain a certain degree of mobility upon the underlying tissues. They obviate the necessity of keeping the grafted surface in contact with another portion of the body for 2 or 3 weeks. Their use permits one to cover the entire raw surface at the first operation and so prevent infection of a clean raw surface by inoculation with bacteria from the adjacent skin. The disadvantages in their use lie in the fact that no subcutaneous tissue may



Fig 4 Free thick graft covering almost all of the palm of the hand

be transferred with the graft and in the risk involved in depriving a considerable area of skin for a definite period of time of its entire blood supply. The clinical and experimental studies of Blair (2) Neuhof (4) Davis and Traut (5) Ferris Smith (6) McWilliams (7) and others however have done much to eliminate uncertainty and permit the use of free thick grafts with constantly increasing assurance of success.

We have not used free thick grafts on granulating surfaces although Davis (1) McWilliams and others believe that there is a definite indication for their use under such conditions. In a few cases we have used free thick grafts on raw surfaces resulting from injury 8 to 24 hours previously (Fig 2) and in each case the graft has been successful. In the great majority of cases however thick grafts have been used to cover fresh raw surfaces left by resection of scar tissue or raw surfaces left after removal of a pedicled flap of tissue to be used elsewhere.

After the complete excision of scar tissue one is frequently surprised by the extent of retraction of the normal tissues and the size of the resulting

defect. Particularly is this true after resection of palmar scars and forced extension of fingers that have been long held in flexion. Unless all the scar tissue is removed, however, and the tissues allowed to retract in every direction, one will be disappointed in the final result. Experienced surgeons indeed turn back the normal skin at the periphery of the defect for $\frac{1}{4}$ to $\frac{1}{2}$ inch and enlarge by so much the raw surface exposed and the size of the graft (Blair, 2) or undermine the normal skin at the edge of the raw surface for a similar distance and slide the graft underneath it (Davis and Traut 5). The excess of covering thus provided compensates for the effect of subsequent contraction and subsequent growth the latter of particular importance when the affected part is a child's hand.

An exact pattern of the raw surface to be covered is made with sterile tin foil, waxed paper or gutta percha. A transparent pattern is easier to secure than one of tin foil. The pattern is laid on the thigh or abdomen and outlined with a sharp pointed knife. The graft is raised by keeping it under tension and cutting with a sharp scalpel. If tension is carefully maintained on the graft itself and on the bed from which it is raised it is possible continually to keep in view the white true skin bare of subcutaneous fat. Securing the graft is the most difficult part of the operation but with care, a sharp scalpel and by keeping the white under surface of the skin constantly in view it is possible to secure a graft free from subcutaneous fat and without perforations.¹

The graft is sutured accurately in place by anchoring it with a few interrupted horseshair sutures, and then suturing it with a continuous horsehair suture. Before the suture is quite completed a pair of narrow bladed artery forceps is slipped under the graft and a number of small



Fig 5 Pedicled graft so thick that function was not improved in any way. A transverse incision had been made across the graft in the hope that the fingers might be extended by such a maneuver. Treatment consisted in excision of the transverse scar, extension of the fingers with retraction upward of the pedicled flap, excision of excess subcutaneous fat and application of a free thick graft over the raw surface.

¹ Type for the graft made in the graft site at a red in place but they occur where the graft is secured they may be secured by the tens with which the graft is made in the holes of the skin.



Fig 6 Free full thickness graft over forehead and reflected portion of forehead flap which is to replace defect of left cheek due to cautery removal of extensive epithelioma. After suturing the graft in place a marine sponge was placed between the forehead and the flap held approximately in the position shown on the left. Other sponges were laid on the graft and the whole bandaged under pressure and left undisturbed for 9 days. When the primary dressing was removed healing was almost perfect.

perforations made with a sharp pointed knife in the skin raised on the open forceps. The perforations permit the escape of blood and serum which may exude from the raw surface on which the graft rests. When the suture is completed, the graft should be under slight tension. If it is relaxed, one must excise a small strip of the graft or draw the sutured edge taut by anchoring it by interrupted sutures to a line parallel to the edge and a few millimeters distant. This method of maintaining tension on the graft, as suggested by Blair, is also used when the edges of the defect have been undermined and turned back in order to increase the raw surface and the size of the graft.



Fig 7 Hand inserted in pocket flap with fingers protruding from individual incisions.

If the graft has been laid on the palmar surface of the hand or fingers, the hand is strapped upon a prepared splint with the fingers in complete extension (Figs 3, 4). If the graft is upon the dorsum of the hand, the fingers are flexed over a roll of gauze.

The graft itself is covered with xeroform vaseline gauze, with several thicknesses of dry gauze, and with marine sponges, and the whole bandaged under firm pressure. Ferris Smith (6) has found that 40 millimeters of mercury is the optimum pressure and suggests the use of flat rubber bags over the dressing which may be inflated to the optimum pressure. We have not had the opportunity of using this method, but have not had difficulty in cases in which sponges could be applied and bandaged firmly in place. Our difficulty has been with situations like the cheek and the web of the finger, where firm counter pressure was lacking or where it was difficult to apply a bandage firmly. In several cases we have been able to obtain satisfactory counter pressure for the cheek by wiring the jaws and placing

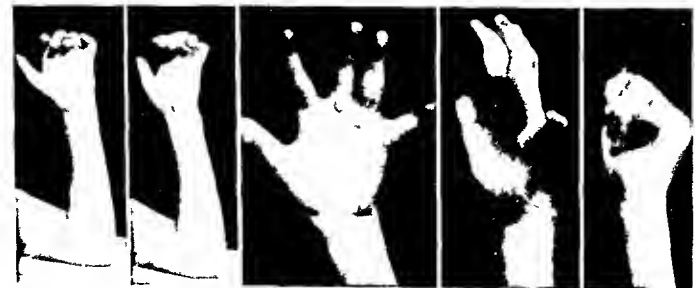


Fig 8 Repair of a contracted hand by the use of a pedicled flap. Lack of sufficient tissue to reconstruct the web between the middle and ring finger restricts separation of these fingers.



Fig 9 Repair of a palmar contracture with a pedicled flap. Restoration of the ability to abduct the thumb is an important factor in the functional improvement of the hand.

between the cheek and jaws a previously formed model of dental impression compound. On the forehead (Fig 6) where the base is firm and smooth and against which one can readily apply pressure Blair states that he has never had a failure after applying a free full thickness graft. The dressing is completed with as little adhesive tape over the bandage as possible so that the dressing may not be sealed from the air.

The primary dressing is removed on the ninth day. If any areas of necrosis are present they are painted with 1 per cent silver nitrate solution. If infection is present gauze dressings saturated with cold boric solution are substituted for the vaseline gauze and changed once daily. In all events sponge pressure is maintained for 3 weeks. Not infrequently small areas of superficial epithelium become necrotic, but the deeper layers of the skin remain viable and regeneration of the superficial layer takes place very rapidly. Even if necrosis of the entire thickness of skin takes place

over a few small areas the raw surface is covered rather rapidly by ingrowth from adjacent areas.

PEDICLED FLAPS

The use of the pedicled flap with a single or still better with a double pedicle gives the surest method of covering raw surfaces with a full thickness of skin and in addition permits transfer of subcutaneous tissue with the skin. Its greatest usefulness is in those cases in which loss of superficial tissue has resulted in exposure of deeply lying structures—tendons, joints, etc. which are normally covered by subcutaneous tissue as well as by skin.

The raw surface to be covered must be prepared as carefully as possible so that it may be dry and free from bacteria. If the raw surface is covered with granulations the surrounding area is shaved, carefully scrubbed with soap and water and finally the raw surface itself is gently washed with soap and water. Excessive granulations are



Fig 10 Repair of a contracture of the hand with a pedicled flap. Note the fixation of the thumb on the left and the degree of abduction possible after operation.



Fig 11 Repair of a contracture due to a burn of the dorsal surface with the aid of a pedicled flap. The flap was purposely made thicker than usual with the idea of using the excess subcutaneous tissue in a subsequent arthroplasty on the metacarpophalangeal joints. Prolonged physiotherapeutic treatment will probably make this step unnecessary.

shaved off and oozing controlled with hot compresses. If the raw surface has been freshly made by removal of scar tissue, particular care must be paid to hæmostasis. Continued oozing underneath a flap will prevent healing and favor development of infection.

In the preparation of the raw surface, removal of all the scar tissue is necessary if one would secure a satisfactory result. In resecting extensive scars one is often tempted to be conservative, with the result that the edges of the flap are sutured to edges that still contain cicatricial tissue. Invariably such suture lines fail to heal by primary union and the result is imperfect. After all scar tissue is resected, the skin edges bordering the defect should be undermined for some little distance from the raw surface on the sides which are to be sutured to the free edges of the flap, so that the skin may be turned back and broad surfaces apposed to one another. Infolding and subsequent retraction of the scar are thus

avoided. The skin edges which are to lie temporarily underneath the pedicles of the flap are not undermined or separated from the raw surface until the flap is completely freed and the final stage of the operation is performed.

In choosing the site for the flap two considerations are of particular importance—the blood supply and the patient's comfort. The graft must lie in such a position that it is assured of an adequate blood supply from definite, known blood vessels. The source of blood supply should be proximal and not distal to the pedicle. The hand, or part to be covered, should be placed in the most comfortable position for the patient. If the dorsal surface is to be covered, the hand is usually placed upon the abdomen, if the palmar surface, over the lumbar region. The position of choice should be determined before the patient is anesthetized and outlined with brilliant green or an indelible pencil. If possible the skin of the graft should match that of the adjacent surfaces,



Fig 12 Repair of burned hands by the substitution of pedicled flaps from the lumbar region for contracted scar tissue.



Fig. 13. Repair of a hand injured in a roller mill by simultaneous dorsal and volar application of clean granulating wounds of single pedicled flaps from the abdomen. Illustrations on the right show the complete restoration of function.

particularly with reference to texture and the presence of hair.

An outline of the flap is made by laying a tin foil pattern of the raw surface over the selected site. The flap itself is cut one third or one fourth larger than the pattern to allow for the contraction of the tissues. Ordinarily we prefer a flap with a double pedicle with its long axis approximately parallel to the long axis of the body. If one with a single pedicle is used the blood supply must come from above and the base of the pedicle should be at least one third wider than the flap itself.

When the raw surface to be covered extends distally upon the fingers the problem of covering it is more difficult. In such cases a flap is raised by undermining the skin through a single incision parallel to the direction of the main blood vessels. At a suitable distance from this incision individual incisions parallel to the first are made for each of the fingers (Fig. 7). When the flap has been elevated the hand is slipped underneath it as into a pocket and the portions of the fingers which are covered with normal tissue drawn through their respective openings. In preparing such a flap it is essential that the pattern be prepared with the fingers separated from each other as widely as possible in order that as much tissue as it is possible to secure be available for the reconstruction of the webs of the fingers. Unless this is done one finds in performing the final suture that there is scarcely sufficient tissue to cover the raw surfaces upon the fingers themselves and no tissue whatever is available to turn down between the fingers for reconstruction of the webs. As a result separation of the fingers from one another is restricted (Fig. 8).

The flap is raised with as little trauma as possible and is made to imitate in thickness and in the amount of subcutaneous fat attached to it

the tissue which it is intended to replace. Too frequently a large amount of subcutaneous fat is left attached to the skin in the fear that its blood supply may be insufficient and the final result is an unsightly swelling which offends the patient's sensibilities. In one case which came under our observation (Fig. 5) so much subcutaneous fat was left on a palmar graft that the patient was quite unable to close his hand and function was no better after the operation than before.

To the pedicles of the flap which are subsequently to be returned to their original position as much subcutaneous tissue as possible is left attached in order that the blood supply of the flap may be as nearly normal as possible. The pedicles should always be wider than the flap and must be elevated sufficiently to permit the hand to lie under the flap without producing tension upon it.

After the flap is freed it is held to one side or lifted in a sling of sterile gauze to protect it from injury while the raw surface underneath is being covered by sliding over it tissue from the sides or laying free grafts upon it. When a flap with two pedicles is raised we attempt to cover the raw surface immediately by undermining the tissues at the side of the defect and drawing them together by tension sutures underneath the flap. These sutures are left long and the ends gathered into one knot to facilitate removal at the end of 8 or 10 days. The line of suture is covered with veroforn vaseline gauze to separate it from the warm moist hand overlying it. The same method of closure may be applied if the flap has a single pedicle, or the defect may be partially covered by drawing together the tissues from the sides and covering the raw surface remaining with Thiersch grafts.

Coverings over the raw surface left by raising a pocket flap, i.e. one which covers both hand

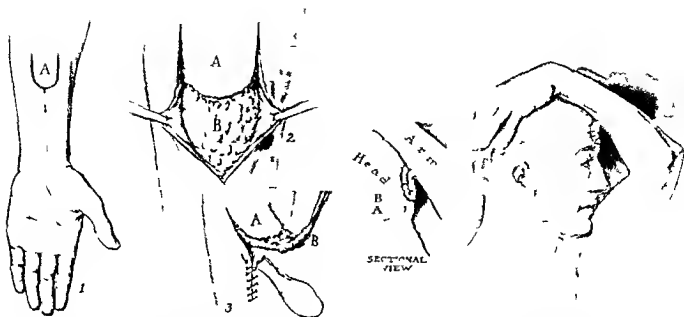


Fig. 14. a and b. Method of securing a thick layer of subcutaneous tissue for filling a defect involving the frontal sinus and overlying tissues. The same principle may be applied in securing a pedicled graft of subcutaneous tissue to insert between the tendons and the bones of the hand or wrist.

and fingers (Fig. 7), offers the greatest difficulty, as there is only one free edge which can be drawn over the raw surface. In a recent case of this type we undermined the free edge, drew it under the hand as far as possible and sutured it to the abdominal fascia. The remaining raw surface was covered with Thiersch grafts as far as one could reach underneath the hand. In this case the Thiersch grafts, held firmly in place by the pressure of the overlying hand, healed perfectly and when the hand was finally separated from the abdomen, the raw surface remaining was only one third the size of the flap removed. The saving of time and the protection of the raw surface from access of infection more than compensated for the added time and effort spent at the primary operation.

When the raw surface is covered as completely as possible the flap is lifted and the hand wrapped in a thin layer of sterile gauze brought into such a position that the raw surface lies directly under the graft. The free edges of the flap are accurately sutured to the corresponding edges of the hand and a dry dressing applied.

In preparing the hand for the graft we have sometimes found tendons bound so firmly to the underlying bone, that it has been necessary to dissect them free to secure free movement. In such cases we interpose a thin flap of fat underneath the tendons by raising a thicker flap than necessary, and separating from its under surface a thin layer of fat to place between the tendons

and the bone. This layer is divided at the middle, and the two halves slipped underneath the tendons, so that each half of the fat flap receives its blood supply from the corresponding pedicle. When a single pedicled flap is used and little subcutaneous tissue is available, a flap of fat may be dissected from underneath the skin just beyond the area of skin which is to be transplanted and doubled back underneath the tendons (as in Fig. 14).

After the operative wound has been dressed the arm must be carefully and firmly immobilized



Fig. 15. Technique of repair of the raw surface following a burn of the axilla. The axilla itself was covered by a pedicled flap consisting chiefly of the subcutaneous tissue of the right breast. The under surface of the arm was successfully covered with Thiersch grafts.

Patients may be restless and uncomfortable for 2 or 3 days after operation. The constant tendency is for the patient to push the arm farther through the pocket and put too great tension upon the flap. To obviate this tendency we mold a plaster triangle in the space between the arm and the body to hold the arm firmly from the body at the proper distance. A light body cast is then applied to hold the arm and triangle snugly apposed to the body. The hand and the graft are left freely exposed for daily dressing.

During the first 48 or 72 hours after operation the flap must be watched with particular care. The arm may shift slightly within the cast or the patient in his attempt to find a comfortable position may advance the hand underneath the flap and so put undue tension upon it. In such an event the cast must be changed or the pedicles of the flap dissected farther back to permit greater relaxation. Death of the flap or a portion of it may occur within 24 hours if there is excessive tension with a resulting ischæmia or passive congestion.

For a few days after operation dressings will be saturated with serum oozing from the exposed raw surfaces of the pedicles. Such surfaces should be protected with veroform—vaseline gauze and the dressings changed each day. If signs of wound infection develop Carrel Dakin treatment should be instituted immediately.

At the end of 10 days detachment of the flap is begun. An incision one half or three fourth inches in length on each side of both pedicles is made under local anæsthesia. This is repeated every second or third day until the flap is free. Before it is finally detached a rubber band constrictor is wrapped tightly about the remaining portion of the pedicle for one half hour. If no change of color occurs the division is completed. If the flap becomes dusky or cyanotic complete separation is delayed for 24 or 48 hours. In the case of a pocket flap the incisions through which the individual fingers have been passed are first united and then the main pedicles divided as described above.

When the graft is completely separated the hand covered with the graft is bandaged with moderately firm pressure for 24 or 48 hours. No attempt is made to finish suturing it to the hand until time has elapsed for any sloughing that may occur at the edges to take place. Usually at the end of 5 or 6 days the excess tissue at the edges of the graft may be excised, the skin at the edges

of the defect freshened and undermined and the suture completed. In performing the suture the skin should be undermined sufficiently so that it can be raised and sutured to the free edge of the graft as an ectropion. The line of suture should not form a groove or depression at the edges of the graft.

As soon as possible, even before the flap is completely detached from its pedicle, movements of the fingers should be begun. No one who has not attempted to free tendons which have become adherent to the surrounding tissues will believe how quickly adhesions develop in the neighborhood of an infectious process and in what a vise like grip they hold the tendons. Fibrous ankylosis of the joints develops with equal rapidity and is quite as effective a barrier to freedom of movement.

SUMMARY

Raw surfaces should be covered as early as possible with normal epithelium to permit healing and prevent impairment of function. Granulating surfaces are best covered with Ollier Thiersch grafts. Fresh raw surfaces may be covered with free full thickness grafts if sufficient subcutaneous tissue is present on the raw surface. If bone, joints, tendons or large nerves or blood vessels are exposed in the wound, a covering of both epithelium and subcutaneous tissue is desirable. This may be secured by the use of a pedicled flap.

In any type of skin grafting cleanliness, asepsis, maintenance of pressure over the graft and conservation of the blood supply are factors essential to success.

REFERENCES

1. DAVIS J. S. The nomenclature of skin grafts. *Surg. Gynec. & Obst.* 1925 xlv: 941. The use of free grafts of whole thickness skin for the relief of contractures. *Surg. Gynec. & Obst.* 1917 xiv: 1.
2. BLAIR WILBY P. Restoration of the burnt child. *Southern M. J.* 1923 xvi: 522. The full thickness graft. *Ann. Surg.* 1924 lxxv: 293.
3. LYLE H. M. H. Skin plastics in the treatment of traumatic lesions of the hand and forearm. *Ann. Surg.* 1926 lxxxiii: 537.
4. NEUFELD H. The Transplantation of Tissues. *New York* 1925.
5. DAVIS J. S. and TRAUT H. F. A method of obtaining greater relaxation with whole thickness skin grafts. *Surg. Gynec. & Obst.* 1916 viii: 710.
6. SMITH F. A rational management of skin grafts. *Surg. Gynec. & Obst.* 1926 xlv: 556. Pressure basis for skin grafting. *Surg. Gynec. & Obst.* 1926 xlvii: 99.
7. McWILLIAMS C. A. Free full thickness skin grafts. *Ann. Surg.* 1926 lxxxiv: 237.

FROM THE SURGICAL CLINIC, BUENOS AIRES UNIVERSITY

THE TECHNIQUE OF IVANISSEVICH'S OPERATION FOR VARICOCELE

BY JOSÉ ARCE M.D. F.A.C.S. BUENOS AIRES ARGENTINE

IN the treatment of varicocele we use the operation proposed by Dr Oscar Ivanissevich in 1918. This operation is based on the idea that varicocele should be considered a disease of the spermatic veins identical with that which affects the saphenous vein in varices, the physiopathology of the two diseases is the same. For this reason Ivanissevich suggests resecting the spermatic vein in the retroperitoneal part of its course when it has left the cord and passes upward in company with the artery, which it is easy to isolate and preserve, just as in varices it is advisable to resect the internal saphenous as high up as possible in order to avoid recurrence.

There is no danger in the operation except for the complications which may arise from infection during operation or from a hematoma from incomplete hemostasis. Embolism resulting from septic thrombosis of the venous stumps has never been observed, injury of the peritoneum is exceptional and unimportant.

The preparation of the patient is limited to rest in bed, an evacuating enema the day before the operation and the injection of sedol half an hour before the operation if local anæsthesia is to be used.

The operation is performed under spinal anæsthesia with novocain or under local anæsthesia, exceptionally in patients who are very timid general ether anæsthesia may be used. When local anæsthesia by infiltration with $\frac{1}{2}$ per cent novocain is used it is completed by a regional injection of 1 per cent novocain, after the manner of Braun.

TECHNIQUE

The steps of the operation are as follows:

Transverse incision of the skin above the bisiliac line 4 to 6 centimeters in length according to the thickness of the panniculus adiposus, the middle point of which is 6 or 7 centimeters within the left anterosuperior iliac spine (Fig. 1).

The subcutaneous cellular tissue is incised and the vessels in it caught and ligated, the aponeurosis of the external oblique is exposed (Fig. 2).

Separation of the aponeurotic or musculoaponeurotic fibers of the external oblique in order to expose the underlying muscles (Fig. 2).

Separation of the muscle bundles of the internal oblique and the transversalis following the direction of their fibers. After sectioning the thin aponeurosis of the internal oblique with a bistoury the fibers are separated with a blunt instrument, closed scissors or closed Kocher forceps (Fig. 3). In this way the transversalis fascia is reached (Fig. 4).

Section of the transversalis fascia at the inner end of the wound, following the direction of the spermatic vessels. The subperitoneal fat is separated, and the bottom of the peritoneal sac to which the packet of spermatic vessels is adherent pushed inward, the vessels are always found in the lowest and innermost part of the operation wound (Fig. 5).

The arteriovenous packet is isolated with a blunt instrument and lifted up on the same instrument in order to inspect and isolate the artery. If the artery is not found at once, the vein or veins which accompany it are isolated, care being taken to spare the cellular tissue.

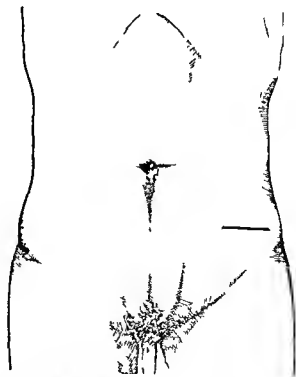


Fig. 1. Incision of the skin and subcutaneous cellular tissue.

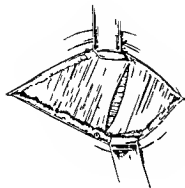


Fig 2

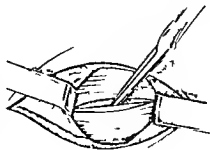


Fig 3

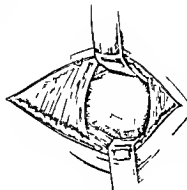


Fig 4

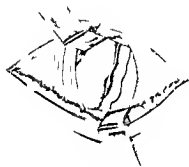


Fig 5

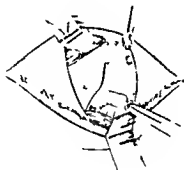


Fig 6

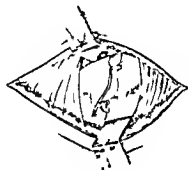


Fig 7

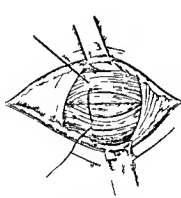


Fig 8

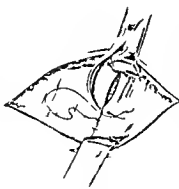


Fig 9

Fig 8 The operation being finished the internal oblique and transversalis muscles are sutured in one layer with interrupted sutures (3 sutures)

Fig 9 The edges of the incision in the aponeurosis of the external oblique are brought together with a continuous suture

Fig 2 Separation of the aponeurotic fibers of the external oblique. The muscle bundles of the internal oblique appear

Fig 3 Separation of the muscle fibers of the internal oblique and transversalis

Fig 4 The fibers of the three large abdominal muscles being separated the transversalis fascia appears and beneath it the subperitoneal fat

Fig 5 The peritoneal artery and a large venous trunk appear. The upper retractor pushes the peritoneum inward and upward

Fig 6 A piece of the venous trunk is resected

Fig 7 The two ends of the venous trunk from which a portion has been resected are ligated

which surrounds them in order not to wound the artery hidden in this tissue generally there are two venous trunks. Two Kocher's forceps are placed 2 centimeters from each other the seg-

ment of vein between the two forceps is resected and the two ends ligated with fine catgut (Figs 6 and 7). The arteriovenous packet is thus reduced to a slender tract made up of the rest of

the common vascular tunic, the spermatic artery together with its nerve plexus and the lymphatics of the testicle

The vessel packet is replaced in the wound and the abdominal wall sutured over it in three layers, the first formed by the internal oblique and transversalis, with catgut (Fig 8), the second formed by the external oblique also with catgut (Fig 9), and finally the skin with horsehair or silk (Fig 10) Michel's hooks may be used for the latter, in which case the subcutaneous cellular tissue should be previously sutured with fine catgut

The wound is covered with gauze kept in place by two adhesive bands, the scrotum is never bandaged or a suspensory used

POSTOPERATIVE CARE

The postoperative care consists in bringing about an evacuation of the intestine on the third or fourth day after the operation and removing the sutures on the seventh day

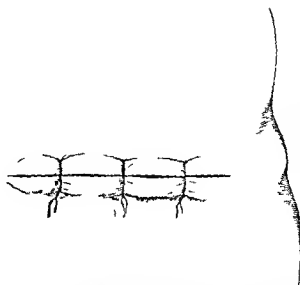


Fig 10 Suture of the skin and subcutaneous cellular tissue with interrupted sutures

No local or general accidents have been seen
The prognosis is good

THE MANAGEMENT OF CARCINOMA OF THE OESOPHAGUS¹

BY M C MYERSON M D NEW YORK

From the Department of Laryngology, Kings County Hospital, Service of Dr. H. A. Rowan, M.D.

CARCINOMA of the oesophagus occurs usually in men after the age of 50. In my series the youngest was 33, while the oldest was 72. Vinson (16) has encountered carcinoma of the oesophagus in women once to every five times in men. In an experience with more than 100 cases I can recall only seven women with carcinoma of the oesophagus. The most frequent site of the carcinoma is in the middle third of the oesophagus. The carcinoma occurring at the lower end of the oesophagus is in the majority of cases associated with and secondary to a carcinoma of the stomach. The efforts of the surgeons and the radiotherapists to effect a cure in these cases deserve commendation and support. Surgery such as has been performed by Lilienthal (7), Willy Meyer (9), Franz Torek (14), Hedblom (3) and others holds a promise for the future. Better results will be obtained if earlier diagnoses are made. Quick (10) who has had a large experience with irradiation in oesophageal malignancy is of the opinion that this type of lesion has been little influenced by radium therapy. While others are bending their efforts to learn the cause of cancer it is our duty to make the remaining term of life of these patients as comfortable as possible. There are certain accepted forms of treatment for carcinoma of the oesophagus. Today gastrostomy is advocated by a majority of men and has a strong supporter in Jackson.

Only too frequently the conduct in such a case is to wait until the patient can no longer swallow and then to have a gastrostomy performed. This delay is not to the best advantage of the patient. As Jackson (5) urges gastrostomy should be performed early it is a safe procedure when performed on patients in the early stages of the disease. As the later stages are approached the mortality percentage makes its appearance and increases according to the poorer condition of the patient. Gastrostomy entails hospitalization. It also requires that the patient must feed himself through a funnel and a tube by way of the stomach. Gastrostomy is known to be uncomfortable and embarrassing.

Dilatation of the stricture is practiced by a few principally Vinson and Moersch (17) of the Mayo Clinic who have performed several hundred such

procedures for cancer of the oesophagus. Vinson favors the dilatation of the carcinomatous stricture for which he uses the Plummer dilators. These are introduced behind a flexible, spring like end, which is threaded over a previously swallowed string. Some use the semisoft flexible fiber bougies of Jackson or Guisez while others favor the string methods of Sippy, Mixter, Plummer, or Vinson. The bougies of Jackson and Guisez are not safe for multiple strictures while the string method seems to be dependable and carries the bougie through all the strictures at the same time. Blind bouginage is mentioned only to be condemned and to emphasize that this procedure was lost to medicine with the arrival of the oesophagoscope and has long been obsolete.

A third method that has not yet been taken up in this country to any extent is the method of dilatation plus intubation of the carcinomatous area. In 1920, Lynch (8) reported three cases in which he intubated the upper oesophagus. It is this method of dilatation plus intubation which has interested me and which I have come to regard as a proved substitute for gastrostomy and an improvement over dilatation alone. The dilatation of the carcinomatous strictures by stringed bougies is safe and saves the patient gastrostomy. But the stricture soon reasserts itself, and further bouginage is necessary. Vinson (18) states that by this means the oesophagus in his patients is kept patent for as long as 2 months. When intubation is practiced, dilatation is required only once, and the tube is worn for the rest of the patient's days. Rubber tubes must be renewed but the sterling silver spiral tubes which are used by Souttar (11) and the sterling silver tubes that I use do not require changing. They may require replacement or adjustment. The statement that a cancer should not be stretched may be significant for accessible malignancies. But a cancer of the oesophagus which is safely accessible only with the oesophagoscope is in a class by itself and deserves special consideration and special means of management. At the present time with a 100 per cent mortality our greatest concern should be the patient's comfort during his remaining life and this is better obtained with dilatation and intubation than by gastrostomy alone. Guisez cites an experience that includes



Fig 1 Carcinoma of middle portion of oesophagus in a man aged 50

1,430 cases. He found that the patients who can take food gain in weight



Fig 3 Barium mixture passing through and around tube which was placed August 10 patient died suddenly October 9 of internal hemorrhage



Fig 2 Tube in stricture area after oesophago-copic dilation with Plummer bougies over a string previously swallowed

I would urge that all peroral oesophagoscopic bouginage be performed over a string previously swallowed. This would insure against perforation which cannot be avoided in 100 per cent of oesophageal strictures in which the Jackson or



Fig 4 Roentgenogram illustrating a case in which the oesophagus is practically completely closed by a carcinoma



Fig 5 Same patient. Roentgenogram shows a 3 1/2 inch intubation tube in position through stricture area. The tube was so well balanced that the barium mixture passed through too rapidly for an X-ray impression.

Guisez bougies are used for dilation. Tucker (15) is of the opinion that esophagoscopy bouginge is relatively safe in careful hands.



Fig 7 Same patient. Roentgenogram showing barium mixture passing both through and around tube.



Fig 6 Roentgenogram showing tube implanted through stricture area.

There are two distinct phases of the technique. The first has to do with the dilatation of the stricture area; the second with the placement of the tube. The first part of the technique follows essentially that practiced by Vinson (19) with the exception that the stringed bougie is passed through the esophagoscope. I have been using a larger tube than has been employed heretofore. The tube is introduced with the aid of the esophagoscope, but not through the esophagoscope, therefore a larger tube can be used.

The patient is given 5 yards of buttonhole twist, size D string or number 3 or 4 braided silk to swallow, 24 or 48 hours prior to the time of esophagoscopy. At esophagoscopy the string is drawn taut and the largest Mosher esophagoscope is passed over it down to the carcinomatous stricture. The Plummer bougies are now threaded on the string and the stricture dilated under direct vision. This can be done until the No. 29 French bougie is reached. After this degree of dilatation is accomplished the involved area may be further dilated by manipulating the No. 29 French bougie or if desired a larger bougie can be threaded and passed through after the withdrawal of the esophagoscope. The No. 29 French bougie gives a dilatation of 10 millimeters.

The dilatation having been accomplished the intubation tube is dropped into the upper esophagus by means of a Jackson upper esophageal speculum. The intubation tube is now resting on the carcinomatous area or has dropped partly through it. The Mosher esophagoscope is again introduced and the intubation tube is slowly and



Fig 8 Roentgenogram showing carcinomatous stricture of middle thoracic portion of oesophagus

gently placed in position by means of large heavy grasping forceps. A Jackson bougie may be employed to assist in the advance of the intubation tube, but this is not usually necessary.

If the condition of the patient is such that he cannot withstand at one session all the manipulation which the intubation entails the procedure can be carried out in two stages. The first stage, then, would end with the dilatation, while the second stage would be devoted to intubation. In my experience the dilatation of any type of stricture whether benign or malignant is better carried out with the stringed bougie oesophagoscopically directed, than by any method so far advanced in the absence of a previous gastrostomy. When it is felt that the patient cannot stand too much instead of using the two stage procedure just described it has been found advantageous to introduce a 5 by 9 millimeter tube through the oesophagoscope so as to shorten the duration of the patient's time on the table.

Dilation and intubation as palliative measures in these cases have been used before.

The earliest intubation of carcinoma of the oesophagus was undertaken by Krishaber (6) of Paris, who reported his first results before the



Fig 9 Same patient. Roentgenogram showing intubation tube in place. In this case the tube became displaced but served to canalize the strictured area so that the carcinoma remained patent until death, almost 4 months later.

International Medical Congress of 1881. Krishaber intubated four patients with oesophageal cancer for periods of 305, 46, 167 and 126 days respectively. His work was immediately recognized for Croft reported his results with the same method in two cases a few months later. Croft kept one patient catheterized for 149 days, while the other wore the catheter for almost 4 months.

The arguments in favor of the method as given by Krishaber and substantiated by Croft (1) were:

- 1 The catheterization can be safely performed
- 2 The presence of the catheter is not dangerous
- 3 The method can be utilized when gastrostomy is out of the question
- 4 The beneficial results are immediate and last as long as the patient lives

In 1884 Charters Symonds (12) employed his method of catheterization at Guy's Hospital. He first utilized a section of a red gum urethral catheter 5 inches long which was blindly but gently introduced into the strictured area with the aid of an ordinary bougie. Symonds (13) still

utilizes this type of intubation he now uses silk web fiber tubes which are introduced with the aid of a whalebone stylet. Without the employment of the œsophagoscope such a procedure can hardly be sanctioned.

In 1911 Hill (4) reported his experience with a styletted rubber tube which he introduced through the carcinomatous area over a previously swallowed thread through the œsophagoscope after the stricture had been dilated by bougies of graduated sizes. His was a modification of the Symonds long rubber tube. It is this method of Hill's that I have followed and of which I was not aware earlier in my work.

Lynah prolonged the lives of three patients with œsophageal cancer. He used a 4 millimeter soft rubber intubation tube in one case. In another he used a short silver tube to the lower end of which was attached a piece of rubber tubing.

Guisez (2) has been using rubber intubation tubes for some time and prefers this method of treatment to gastrostomy.

Souttar has been using tubes made of spiral wound German silver wire which he introduces through the œsophagoscope. His largest tube is 8 centimeters long and 10 millimeters in diameter, the smallest is 6 centimeters long and 6 millimeters in diameter. These are funnel shaped at the upper end.

My tubes are oval of solid German silver of light weight and vary from 3 to 4½ inches (8 to 11 centimeters) in length. They can be cut shorter if necessary. The tubes are made in two sizes 10 millimeters by 6 millimeters and 15 millimeters by 10 millimeters being the measurements of the lower ends. The upper ends are expanded and funnel shaped.

After the tube has been implanted fluoroscopy is employed to ascertain its proper placement and the patency of the œsophagus is studied with the aid of a barium mixture. The patient is now permitted to eat anything he chooses provided he eats small enough quantities for each bolus and masticates his food well. He enjoys the pleasure and comfort of the family table and has nothing to be sensitive about. It is advisable that he drink milk, water, tea or coffee occasionally during his meal to wash through the tube. In addition to the passage which the tube itself provides, the presence of the tube seems to cause further passage between its outer wall and the wall of the œsophagus.

I have employed this method in five patients and am satisfied as to its feasibility and value. In one of the patients the intubation was un-

successful because the tube was too short for the strictured area. Since that experience some longer tubes have been made.

In dilatation and intubation we have a method that bids fair to supplant gastrostomy as a palliative measure in the treatment of carcinoma of the œsophagus. My tubes being of a larger caliber than any heretofore used insure more adequate passage for food going to the stomach. The patient does not feel the presence of the tube and can swallow the food he has been accustomed to partake of provided he is careful. He can enjoy solid foods with my tubes whereas only liquids could be taken with the tubes that have been devised by Krishaber, Croft, Hill and others.

The tube is not easily displaced and remains in the carcinomatous area for comparatively long periods of time. The inside of the tube is smooth so that food particles do not adhere to it. Guisez has shown that patients who are able to swallow sufficient food increase in weight. With sufficient nourishment comes better health and greater strength.

BIBLIOGRAPHY

1. CROFT JOHN. The treatment of cancerous stricture of the œsophagus by permanent catheterism illustrated by two cases. St. Thomas Ho p Rep 1887 xii 45.
2. GUISEZ J. Carcinoma of the œsophagus. J Laryngol & Otol 1925 xl 213.
3. THEODOR C. Combined transpleural and transperitoneal resection of the thoracic œsophagus and the cardia for carcinoma. Surg Gynec & Obst 1912 September p 284.
4. HILL W. Carcinoma of the œsophagus dysphagia treated by a new form of intubation apparatus. Proc Roy Soc Med Sect Laryngol 9 1911 Apr 7 p 123.
5. JACKSON, CHEVALIER. Carcinoma and sarcoma of the œsophagus a plea for early diagnosis. Am J M Sc 1925 clii 625. This contains a comprehensive bibliography.
6. KRISHABER. De la sonde œsophagienne à demeure. Tr Int med Cong 2 1881.
7. LILIENTHAL H. Carcinoma of the thoracic œsophagus extrapleural resection and plastic the description of an original method with report of a successful case without gastrostomy. Ann Surg 1921 lxxiv 259.
8. LYNNAH H. L. Borderline diseases of the œsophagus. Tr Am Laryngol Rhinol & Otol Soc 1920.
9. MEYER WILLY. The surgical treatment of cancer of the œsophagus. M Rec 1913 lxxxiii 888.
10. QUICK D. Some considerations in the treatment of carcinoma of the œsophagus. Am J Roentgenol 1924 vi 383.
11. SOUTTAR H S. A method of intubation of the œsophagus for malignant stricture. Brit M J 1924 i 782.
12. SYMONDS CHARTERS. The treatment of malignant stricture of the œsophagus by tubage or permanent catheterization. Brit M J 1887 i 870.

- 13 Idem An account of the short tube for the treatment of stricture of the oesophagus *Guy's Hosp Rec* 1925 lxxv 141
- 14 TOREA FRANK The operative treatment of carcinoma of the oesophagus *Ann Surg* 1915 lxi 383
- 15 TUCKER G Cicatricial stenosis of the oesophagus with particular reference to treatment by string retrograde bouginage with the author's bougie *Ann Otol Rhinol & Laryngol* 1924 xxxiii 1180
- 16 VASOV P P Carcinoma of the oesophagus *Am J M Sc* 1923 clxvi 407 This contains a comprehensive bibliography
- 17 VASOV P P and MOERSCH H J Dilation versus gastrostomy as a palliative treatment of carcinoma of the oesophagus *J Am M Ass* 1923 lxxxiv 658
- 18 VASOV P P Personal communication to the author
- 19 Idem Cancer of the oesophagus *M Clin N America* 1925 viii 10 7

CHARCOT JOINTS IN A CASE OF SYRINGOMYELIA

By RALPH K. GHORMLEY, M.D., BOSTON, MASSACHUSETTS

From the Orthopedic Service of the Massachusetts General Hospital

THE presence of remarkable joint changes in a patient recently admitted to the orthopedic service of the Massachusetts General Hospital, combined with other lesions of an unusual character, furnishes the basis of this report.

A male aged 17 years was admitted complaining of swelling and weakness of the left knee of 3 years duration. Patient is of French Canadian parents but has always lived in the state of Vermont. Father died of cancer of stomach age unknown. Mother died of heart trouble age unknown. One brother and a sister are living and well. One brother died at birth cause unknown. Patient does not know about his childhood diseases. Had influenza in 1918 with good recovery. Has only reached the fifth grade in school.

The left knee began to swell about 3 years previous to his admission. Previous to this the examination time being indefinite an operation was performed on his left ankle for tuberculosis and at the same time amputation of the first second and third toes was done—the distal phalanges only being removed. Dating back for a period of about 10 years the patient has been troubled with blisters which formed on the toes and fingers. These have never been painful healing took place slowly often with some loss of bone from the distal phalanges.

Physical examination (Figs. 1 and 2). The patient is fairly well developed. The facies suggests some mental retardation which is borne out as one questions the patient. The positive findings in the case are a striking enlargement of the left knee joint—the distal joint is evidently filled with fluid and there is marked hypermobility of the joint and no pain on movement. There is a similar enlargement of the left ankle with some tendency to equinus (Figs. 3 and 4). The right knee shows some excess of fluid and a slight amount of capsule thickening but no hypermobility. The scar of the operation is present on the inner side of the ankle joint and is well healed. The amputated toes are healed with practically no scars. On the first and second toes of the right foot are ulcerations through the skin involving the terminal phalanges. The hands show ulcerations fresh and partly healed about all of the distal phalanges and on most of the fingers the nails are partially destroyed. There is partial motor paralysis involving the extensors of the toes of the left foot. The deep reflexes are present with the exception of the knee jerk on the left. The knee jerk on the right is obtained only with reinforcement. There is no ankle clonus or Babinski. The disturbance of

sensation (Fig. 5) is segmental in type. There is anesthesia to pain heat and cold over the area marked on the chart. Over the feet and the left leg there is slowness of response to tactile discrimination and muscle sense stimuli. In the hands a similar condition exists although the muscle sense seems better preserved. There is some enlargement of the epitrochlear and inguinal lymph nodes.

The blood examination showed hemoglobin 95 per cent red blood cells 4,850,000 white blood cells 9,800. Differential count polymorphonuclear 65 per cent lymphocytes 29 per cent eosinophils 1 per cent transitionals 2 per cent. The urine was negative. The blood Wassermann was negative. The spinal fluid showed a count of 1 cell per cubic millimeter Wassermann negative total protein 22 colloidal gold solution 000110000. Smears from the nasal mucosae made after administration of potassium iodide showed no acid fast bacilli. An epitrochlear gland and a piece of the external popliteal nerve of the left leg also showed no acid fast bacilli.

In Charcot's (1) original article he described four cases of sudden painless swelling of joints associated with the characteristic lesions then known as locomotor ataxia. He mentions no other possible causes in that article although he refers to the cases of joint lesion described by Mitchell (5) in 1831 accompanying Pott's disease with paraplegia. These Charcot believed to be "subacute articular rheumatism." In a later publication, Charcot (2) mentions the possibility of the so called arthropathies occurring in paraplegia from Pott's disease and in injuries to the spine.

Chapault (3) later mentioned several possible causes of Charcot's joints, such as Pott's disease with paraplegia, injuries to the cord by fracture of the spine, and tumors of the cord and meninges and cites cases of his own and others in support of his contention.

Turney (12) gives as causes of Charcot's joints tabes, syringomyelia and injuries, and in addition states that the weight of evidence shows that Charcot's joints may occur in leprosy.

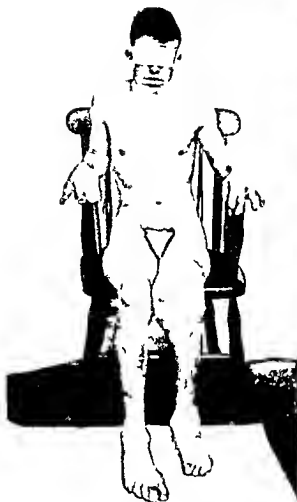


Fig. 1 Photograph of patient showing enlargement of the left knee joint and of the left ankle and amputation of great toe on left foot. Note also the ulcerations on the fingers of both hands and on the toes of the right foot.

In later publications many cases of so called neurotrophic arthropathies have been described. While the majority of cases no doubt occur in syringomyelia and tabes dorsalis a great number of textbooks fail to mention the possibility of these joints occurring in other conditions. Philips and Rosenheck (8) report two cases of trophic joint disturbance in peripheral nerve injury. Venturing to formulate that a neuro arthropathy may be wholly the product of a peripheral nerve disease or injury.

We were then confronted with the question of determining the causative factor in a case of multiple Charcot's joints in a youth of 17 years. Tabes was satisfactorily excluded by (a) the age of the patient which is unusual for this disease



Fig. 2 Photograph of hands showing ulcerations about the terminal phalanges of all the fingers. Some are healed others in a more active stage.



Fig. 3 X-ray of hands. Note destructive changes in terminal phalanges.

without history of infection (b) the negative blood and spinal fluid examinations (c) the presence of a knee jerk in the right leg (d) the unusual sensory disturbance (e) the absence of eye changes.

Schlesinger whose monograph (9) is the classic on syringomyelia states that at times one of the most difficult diseases to differentiate from syringomyelia is leprosy. The essential points in the differential diagnosis are outlined by Schlesinger (10) and corroborated in fact by Hanel (4) and Oppenheim (7). They are: Leprosy must be contracted by contact therefore most cases come from an area where this disease is endemic while syringomyelia is probably never gotten by contact. In leprosy there are usually spindle shaped swellings along the peripheral nerves usually demonstrable in the greater auricular nerve and one can often demonstrate the bacilli in a piece of the excised nerve. The anesthesia in leprosy being due to a peripheral nerve lesion is practically always patchy and there are usually areas of skin devoid of pigment. In syringomyelia however the anesthesia is segmental in type. In leprosy there is often peripheral facial paralysis which is



Fig. 4. Lateral X-ray of left knee showing changes typical of Charcot's joint

rare in syringomyelia. In leprosy depilation is common in certain areas particularly the eye brows and eyelids, while it is uncommon in syringomyelia.

In connection with syringomyelia should be mentioned a disease described by Morvan (6) as a clinical entity. Starr (11) says that Morvan's disease has been proved to be syringomyelia as autopsies on some of the cases showed cavities in the spinal cord. Most writers now refer to this as a form of syringomyelia. It should be pointed out that Morvan's cases were of analgesic and painless whitlows of the upper extremities only.

Finally, there exists a certain amount of confusion due to the fact that in cases of syringomyelia, lepra bacilli have been demonstrated in the cord, and Starr includes infection as a possible cause of syringomyelia.

To summarize briefly the evidence in this case for syringomyelia and against leprosy and tabes, we present these facts:

1. Charcot joints (Turney) may occur in (1) tabes dorsalis (2 to 4 per cent of cases), (2) syringomyelia (10 to 40 per cent of cases), (3)

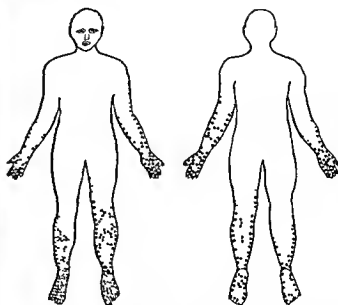


Fig. 5. Charts showing distribution of anesthesia. Pain heat and cold are absent over the areas marked. There is some disturbance of muscle sense on the left leg.

spinal injuries, and (4) spinal caries, rare (5) leprosy (Hansen).

B. 1. Tabes (a) no pupillary changes, (b) knee jerks present on reinforcement on right, (c) negative Wassermann, (d) normal spinal fluid. **2. Syringomyelia** (a) sensory dissociation, (b) trophic changes in hands and feet, (c) multiple neurotrophic arthropathies, (d) segmental distribution of sensory changes. **3. Leprosy**—anesthetic type. Most important differential diagnosis from syringomyelia (Schlesinger) (a) No evidence of any contact, (b) lack of spindle shaped nerve thickenings, (c) failure of demonstration of bacilli in excised nerves, (d) peripheral facial paralysis absent, (e) oval cicatricial patches devoid of pigment absent, (f) discrete patches of anesthesia not found.

BIBLIOGRAPHY

1. CHARCOT JEAN MARTIN. Sur quelques arthropathies qui paraissent dépendre d'une lésion du cerveau ou de la moelle épinière. Arch. de physiol. norm. et path. 1868, 1, 161.
2. Idem. Leçons sur les maladies des systèmes nerveux. 1883, p. 111.
3. CHIPPAULT A. I. État actuel de la chirurgie nerveuse. 1902, 1, 142.
4. HANSEL H. Lewandowsky's Handb. der Neurol. 11.
5. MITCHELL J. K. Am. J. M. Sc. 1831, VIII, 55.
6. MORVAN. Gaz. hebdomadaire de méd. Paris, n. 5, xx.
7. OPPENHEIM H. Lehrbuch der Nervenkrankheiten.
8. PHILLIPS HERMAN B. and ROSENTHAL CHARLES J. Am. M. Ass. LXXXI, 169.
9. SCHLESINGER H. Die Syringomyelie. Leipzig, 1902.
10. Idem. Curschmann's Textbook of Neurology (Burr).
11. STARR M. ALLEN. Alburt and Rolleston, vol. VII.
12. TURNER H. G. Ibid.

PREVENTION AND RELIEF OF PROLAPSUS UTERI¹

BY ROLAND S. CROW, M.D., I.A.C.S., MILWAUKEE, WISCONSIN

THE problem of the prevention and relief of prolapsus uteri with or without rectocele or cystocele has been one that has confronted mothers as well as physicians ever since the act of childbirth has become more of a pathological process than it was generations ago. There can be no doubt left in the minds of medical men that the higher one ascends the scale of culture, refinement and education the more frequently does one find abnormalities in the childbearing functions of women. In part this is due to the change in musculature and in part to the nervous instability of the woman. The expulsive forces which are brought into play at the time of labor are probably not as efficient nor as effective as they were a few generations back when women were compelled to exercise more freely. This coupled with the idea that a woman should labor for a certain prescribed number of hours and then to experience only a minimum amount of pain has induced physicians to hasten many deliveries by one means or another.

In order to prevent uterine prolapse and its associated complications one must first understand the cause and method of production of such conditions. Undoubtedly congenital defects in the development of supporting structures such as fascia ligaments muscle and the inclination of the pelvic bone as well as malpositions of the various pelvic organs especially the uterus are great factors in the production of prolapsus. If this were not true every woman subjected to one of the activating causes would be going about with a descensus of one or all of the pelvic organs.

Given an individual with a defective pelvic anatomy childbirth may be the link in the chain which eventually results in a prolapsed uterus. A precipitate labor or one hastened by the administration of pituitary extract may so loosen the attachments of the bladder rectum or uterus that they will descend in the path of least resistance. Again a forceps delivery especially if performed through a partially dilated cervix or any difficult operative maneuver may strip and tear the fascia ligaments and muscle to the extent that only a most thorough reconstructive operation will later support the pelvic organs. In order to prevent such a thing from happening it has been our custom in most primiparous labors and operative deliveries to perform a mediolateral episiotomy before the presenting part has exten-

sively stretched the perineum. It is doubly important to perform this prophylactic operation during a protracted second stage of labor especially in cases in which the bladder is being rolled off of its anterior attachments or in which the pubic arch and the correspondingly contracted bischial diameter forces the head through the soft parts. Furthermore the operation directs any continuation of the incision by tearing to the right or left of the rectum thereby preventing a third degree laceration. It is an accepted fact that a clean cut wound is more satisfactory to repair and that it heals more rapidly and accurately than one the result of a tear. As a result of following this line of reasoning my associate Dr. Davis and I have performed 294 episiotomies during the last 500 deliveries *per vaginam*. Fifty-three per cent of normal labors were assisted by this operation while 63 per cent of operative deliveries were preceded by a mediolateral incision of the perineum. The feasibility of this procedure has been definitely proved when 6 weeks post partum one finds the soft parts healed to the extent that they resemble those of a nulliparous woman.

All lacerations of the soft parts should be discovered and immediately repaired. Frequently submucous lacerations of the muscle and fascia occur without a break in the skin or mucus membrane. Recently a semicircular mattress suture has been satisfactorily used in this type of tear and also in old relaxations of the posterior vaginal wall.

A common complication of labor and one that is conducive to cystocele and prolapsus is a full bladder. There is nothing less compressible than a bag of water. It is therefore imperative that the patient empty the bladder frequently and completely or else that the urine be withdrawn by means of a catheter at regular intervals.

There are a number of steps in the evolution of a condition such as a prolapsed uterus. It is usually preceded by retroversion of the uterus then beginning descensus with elongation and hypertrophy of the cervix. This is frequently associated with a cystocele or rectocele or both and then the appearance of the cervix outside of the vagina, and if this condition is not remedied a complete prolapsus of the uterus and occasionally a herniation of the posterior cul de sac may result.

¹Presented before The Chicago Gynecological Society, March 29, 1926. (For discussion see page 74.)

In a beginning prolapsus, the situation can usually be satisfactorily remedied by a proper operation on the cervix, plecting or overlapping of the bladder fascia with advancement if necessary of the bladder on to the lower segment of the uterus, a colpoperineorrhaphy, an anterior subfascial shortening (modified Gilliam) of the round ligaments and, if necessary, shortening of the sacro uterine ligaments (Bovee technique). When however, the beginning prolapsus is associated with a large cystocele and likewise in the majority of cases of second degree descensus of the uterus, the operation of choice is one first described by the late Thomas J Watkins. It consists in interposing the fundus of the uterus between the bladder and anterior vaginal wall. The uterus acts as a very efficient plug for the herniated bladder. This operation is then followed by a very thorough and extensive repair of the posterior vaginal wall and perineum. When the cervix is elongated, hypertrophied, or ulcerated it should be amputated before the sutures suspending the ante-flexed uterus to the anterior vaginal wall are tied.

It has been possible to review the records and to follow up the patients on whom the Watkins interposition operation has been performed by thirteen different operators during the past 14 years. An analysis of these records follows. The analysis covers a series of 225 patients operated upon during the period 1910 to 1924, 14 years. The youngest patient was 20 years of age, the oldest 72 years, the average being 54 years.

The operation should be reserved for patients who have reached the menopause or are approaching it. There were 59 women still menstruating, all but 12 were sterilized by resection of the fallopian tubes and burial of the resected tip below the peritoneum. One of those not sterilized later conceived. Because of a dystocia, the result of a malposed uterus, and a placenta prævia she was delivered by caesarean section. She died from hemorrhage and subsequent sepsis.

There was no relation between the number of labors and the frequency or extent of the pelvic lesion. Two women had never borne children. One of these was aged 50 years and had had a complete prolapse for 8 years, while the other aged 62 was found to have a second degree descensus with a large cystocele. Eighty five patients were delivered by operative measures and only 13 admitted having had a repair done at the time of the labor. Apparently instrumental deliveries are not as important a factor in the cause of prolapsus as failure to properly repair the pelvic diaphragm.

TABLE I—DIAGNOSIS

	Cases
Complete prolapse	46
Second degree prolapse	109
First degree prolapse	4*
Retroadisplacement with cystocele or rectocele or both	20
Cystocele and rectocele	8
Complete laceration	8

It is interesting to note that about one fifth or 46 patients had a prolapse to the extent that it was considered complete while in others there was very little descensus (Table I). Even so the interposition operation was used in all to correct the pelvic pathology. It is exceedingly rare to find a condition of complete laceration of the perineum and descensus of the uterus in the same patient. This did prevail eight times, twice when the diagnosis of complete prolapse had been made.

TABLE II—OPERATIONS—THIRTEEN OPERATORS

Watkins interposition	225	Ovaryectomy	7
Colpoperineorrhaphy	223	Mysomectomy	5
Amputation of cervix	122	Perforation of rectum	2
Dilatation and curettage	85	Perforation of bladder	2
Resection of tubes	47	Obiteration of vagina	2
Complete tear	8	Herniotomy	3

All but 2 of the 225 interposition operations performed were followed by colpoperineorrhaphy (Table II). When necessary even more extensive support was given to the posterior vaginal wall. Some cervical operation, usually an amputation, was found advisable in more than one half of the patients. Accidental perforation of the bladder or rectum in 4 patients did not seriously complicate their recovery.

TABLE III—ANÆSTHESIA

General—ether gas oxygen or ethylene	212
Spinal	3
Local	10

Since the operation is frequently performed on senile women who are consequently bad risks, it is at times advisable to administer one of the compressed gases such as nitrous oxide oxygen or ethylene (Table III). The operation may also be done under spinal or local anæsthesia without appreciable discomfort to the patient, provided there is a minimum amount of peritoneal manipulation.

TABLE IV—POSTOPERATIVE RECOVERY

Afebrile	124	Catheterized	174
Febrile	64	Urinated spontaneously	49
Febrile (1 day)	35		

If one will consider a rise of temperature to 100.4 as a normal postoperative reaction, one finds that a comparatively small number, 64

patients had a febrile convalescence for more than 1 day (Table IV). With the establishment of routine catheterization until the residual urine in the bladder after spontaneous micturition was reduced to 1 ounce and with the instillation of 1 ounce of 1/800 silver nitrate solution into the bladder following catheterization it was found that the convalescence was more frequently afebrile and associated with very little bladder disturbance.

Postoperative cystitis in 32 patients and suprapurification of the anterior or posterior vaginal wall in 20 others complicated the convalescence and undoubtedly were the causes of the elevated temperature. The repair of a third degree laceration was a failure. Two operative deaths occurred. Both patients were poor risks but hemorrhage from the stump of an excised ovarian cyst in one and oozing from the bladder plexus in the other were the deciding factors between life and death.

TABLE V—ULTIMATE RESULTS

	CASES
Patients followed up	183
Satisfactory	(90%) 157
Minor complaint	13
Rectocele or cystocele	8
Beginning prolapse	1
Recurrence (3.8%)	7
Operative deaths (1%)	2

These patients were either seen one or more years after the operation by the family physician or the operating surgeon or they answered detailed questionnaires covering their symptoms and the ultimate condition of their pelvic organs. Complete relief of the symptoms from which the patient complained was obtained in 15 cases while the only complaint in 13 others was that of a slight difficulty in micturition or defecation (Table V). Considering this latter group as being relieved of their more serious and distressing symptoms one can feel that at least 90 per cent of the patients obtained both a functional as well as a reconstructive cure. A few had a recurrent cystocele or rectocele easily remedied by a plastic operation. There were 7 patients who did not derive any benefit from the operation. Recurrence of a complete prolapsus followed extreme exertion in three instances while in the case of two others the uterus returned to its position at the introitus within 3 months following the operative correction. Two of the uteri interposed were atrophic and therefore too small to act as an efficient tamponade. Postoperative infection did not seem to be a factor in accounting for the

recurrence, for the convalescence in five of this group was afebrile.

Many other operations have been used to cure prolapsus. One of the most satisfactory for complete prolapsus especially in patients in whom it is advisable to remove the uterus, is a combination of a vaginal panhysterectomy with overlapping of the bladder fascia and anchoring of the base of the bladder and vault of the vagina to the conjoined cardinal (round broad and sacro-uterine) ligaments. With a well constructed posterior vaginal wall Lynch Phaneuf and others feel that 100 per cent relief of the prolapsus should be obtained. The fixation of the uterus or of the cervix following supravaginal hysterectomy to the fascia of the rectus abdominis muscles without repair of the bladder fascia and proper support to the perineum gives only temporary relief. If a firm pelvic floor has been built the abdominal work is unnecessary and only adds to the mortality. The cystocele like any other hernia cannot be cured unless the fascia through which the rupture has occurred is properly restored or plugged by some fixed object.

The interposition operation is successful because it uses fixed structures for support. The uterus acts as a shelf to hold the bladder and is elevated in the pelvis by being tipped forward its position being changed 180 degrees. The twist produced in the broad ligaments by the change in the position of the uterus perceptibly strengthens them and is the chief factor in correcting the uterine prolapse and finally as Miller has brought out the tendencies of the uterus and bladder are antagonistic to further prolapse as they work against each other to hold the correct position.

NOTE.—This study was started while the writer was associated with Dr. Reuben Peterson at Ann Arbor, Michigan and continued by him in Milwaukee. Most of the patients on whom the Watkins operation was done were operated upon by Dr. Peterson and his associate. Through the courtesy of Dr. Peterson the writer has been given the privilege of reporting these with others operated upon by Dr. C. H. Davis and himself.

BIBLIOGRAPHY

- FEAVITT, FRED E. Median episiotomy. *J. Lancel* 1915 xlviii 31.
 LYNCH, FRANK W. Etiology and treatment of prolapse. *Surg. Clin. North America* 1922 April.
 PHANEUF, L. E. Uterine prolapse, cystocele and rectocele. *Am. J. Obst. & Gynec.* 1924 viii 322-333.
 MILLER, C. JEFF. Indications and results of interposition operation in treatment of cystocele and prolapse of uterus. *Surg. Gynec. & Obst.* 1924 xxxviii 348-351.

INTESTINAL FISTULÆ

A METHOD OF PREVENTING SKIN EXCORIATION¹

By JOSEPH F SMITH, M D, F A C S AND H H CHRISTENSEN M D WAUSAU WISCONSIN

DRAINAGE from a high enterostomy presents a formidable condition. In the course of 24 to 48 hours, the skin shows marked irritation. Continued drainage after this time produces a painful, raw, beefy surface and the patient is sorely harassed by the "burning and eating," as it were, from each quantity of intestinal juice emitted with which the external surface comes in contact. The periodicity of the escaping secretions follows the rhythmic movements of the intestine and allows of no adequate rest, day or night. The increased peristalsis and the larger quantity of juices ejected from the fistulæ following the ingestion of food becomes especially troublesome and the patient is reluctant to eat, thus, a vicious circle is established which often threatens the patient with starvation. The patient becomes emaciated, first because of the quantity of nourishment lost by the food escaping from the fistula and, second, because the patient early learns that food taking is soon followed by bowel peristalsis and the escape of irritating bowel contents with greatly increased pain, he learns to avoid pain by refraining from eating. There resulting interference with the physiological processes of rest and nutrition must of necessity decrease markedly the opportunities for recovery and wound healing.

Fistulæ of the small bowel intentionally produced may be carried out by the Witzel or some of the other methods which effectually guard against the possibility of leakage of intestinal contents. In the accidental cases or those arising during the treatment of septic conditions, we have no adequate means of developing the fistulæ under any such satisfactory conditions.

Among the means which have been employed in the treatment of skin excoriation may be mentioned the application of moist dressings, pastes, ointments, and direct exposure of the skin surface to sunlight and air. The intestinal juices quickly and readily undermine any layer of ointment or paste or lift up any film of paraffin or a similar substance applied to the skin even when the skin is carefully dried before their application. The excoriation of the skin surface then proceeds more violently and rapidly beneath the undermined layer of ointment or paste and tends to spread out widely over the skin surface. The

most important feature in the management of small bowel fistulæ consists in preventing promptly by some adequate means the excoriation of the skin about the fistula and the resulting pain and interference with the patient's rest and food taking.

Any rational and satisfactory method of management must be based on processes which eliminate the cause of the excoriation without injury to the patient. It is well known that such excoriation is due to the action of the digestive enzymes poured out in the bowel secretions. Thus, any means of preventing or controlling this excoriation must be based upon some method of destroying or inhibiting the enzyme action. Many methods of producing inactivation of enzymes known to biological chemistry would, for obvious reasons, be unsuitable for use in applications made to living tissues.

E Fischer (1) discovered that enzymes combine with certain substrates and only when this combination exists is the enzyme chemically active. Substances preventing this combination of the enzyme and the substrate would, therefore, inhibit enzyme activity. Enzymes are readily taken up by finely divided substances, such as inorganic precipitates, charcoal, kaolin, infusorial earth, alumina, iron hydroxide, colloids, proteins, etc. and their activity is thereby inhibited (2). This inhibition, Hedin (3) regards as brought about by a colloidal reaction, by absorption between the enzyme and the solid or colloidal phase. Evidence substantiating this conclusion indicates that during the action of the retarding substance upon the enzyme the quantity of water present, or the degree of hydration, does not affect or retard the final result. This reaction has been shown to be more or less irreversible and results in the binding of the enzyme.

A variation in the efficiency of different substances for absorbing the enzyme has been demonstrated. For practical reasons, kaolin and charcoal are the most useful for this purpose. These substances recommend themselves because, being readily available at small cost, they can be used in quantities sufficient to absorb the escaping fluids. The procedure we have used consists in mixing a sufficient quantity of the sterilized powdered kaolin with glycerine to make a thin paste

¹ Read before the Western Surgical Association, Wichita, Kansas, December 10, 1925.

The kaolin glycerine paste is then applied to the body surface surrounding the wound making a close adhesive dressing next to the skin. Over this we spread a generous quantity of powdered kaolin to absorb the escaping fluids. This in turn, is covered with the usual dressings. Charcoal was used at times for the powdered portion of the dressing but because of its disagreeable color, it is objectionable for this purpose.

Applications as outlined above have been sufficient to keep the patient comfortable for a period of 5 to 6 hours. As the fistulae have contracted two applications in 24 hours have been adequate.

CASE REPORTS

Case No 15373. A Polish boy, T. R., 7 years old was admitted to St. Mary's Hospital on September 16, 1924, with a generalized peritonitis from a ruptured appendix. Appendectomy and drainage was done immediately. Obstructive symptoms developed a week later on three different occasions and each time were relieved by the giving of saline solution. A modified Witzel enterostomy was then done with satisfactory results but the tube unfortunately was released on the third day after operation. The skin surface surrounding the wound was covered immediately with zinc oxide ointment. This could not be made to adhere and 3 days later gauze treated with beeswax was applied to protect the skin. This was also disappointing and the skin became very much irritated and painful. Then followed trials of the paraffin spray, boric acid, sunlight and egg white. None of these means adequately protected the skin which by this time was weeping and painful. Kaolin and charcoal mixture was then applied several times daily with complete comfort to the patient and a restoration of the skin to quite a normal state. This was continued until November 8, 1924, when the wound was taped shut. The patient was discharged well on November 11, 1924.

Case No 1613. Mrs. F. B., 53 years old had redness and burning about the wound following a transduodenal choledochotomy on April 6, 1925, for a stricture of the

common duct at the ampulla of Vater. The stools were mushy and foamy for a week. One application of kaolin and charcoal daily was sufficient to protect the skin against further irritation. Ten days later the skin had a normal color. Patient was discharged well on May 8, 1925.

Case No 16574. Mrs. W. E. B., 45 years old developed a leakage of the intestine with drainage of bowel contents through the wound 24 days after an abdominal operation. Large quantities of clear yellowish fluid escaped. The wound and the surrounding tissues became markedly injected and painful. Kaolin as outlined was used for protection of the surface. A fresh application was made every 5 or 6 hours while the drainage was profuse. Later two applications in 24 hours sufficed. A month later when the general condition of the patient warranted the attempt a jejunal fistula was successfully closed. In another month the patient was discharged well.

SUMMARY

We have presented what we have found to be a rational and satisfactory method of preventing excoriation from intestinal drainage. The enzymes are inhibited by absorption of inorganic substances. Kaolin is preferred, being readily available, easily sterilized, inexpensive and suitable as a surgical dressing. Patients with small bowel fistulae can be made comfortable at once by the application of kaolin glycerine dressings to the skin. Those patients with extensive skin excoriation may be controlled to the extent that the skin and other tissues about the fistula may be restored to a condition which will permit a surgical repair or closure to be carried out.

REFERENCES

1. HAMMERSTEN and HEDIN. A Textbook of Physiological Chemistry, 5th ed.
2. DALWE. Hofmeister's Beiträge 1905, 11: 426.
3. HEDIN. Biochem. J. 1906, 11: 81.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D.
ALLEN B. KANAVEL, M.D.

Managing Editor
Associate Editor

WILLIAM J. MAYO, M.D.

Chief of Editorial Staff

NOVEMBER 1926

THE SAFETIES OF ETHYLENE ANÆSTHESIA

CHLOROFORM as an anæsthetic has been practically abandoned in this country, for its dangers are well known. Ether is no longer considered the ideal anæsthetic for the general surgeon, because pulmonary and gastro intestinal complications after operation are frequent and its taste, smell and postoperative effects are obnoxious to the patient. Its administration to the badly injured or seriously ill patient requiring a major operation may be the deciding factor of danger and its use is no longer justifiable in minor surgery. The public in many localities will not consent to its use and the patient comes to the surgeon questioning the kind of anæsthetic which is to be administered.

Nitrous oxide and oxygen anæsthesia has supplanted ether in many clinics, for its advantages over ether are many. However it may be a dangerous anæsthetic in unskilled hands, for unquestionably there have been many deaths unreported which might be attributed directly to its use. Gwathmey has shown that the margin of safety afforded by

ethylene is greater than that of nitrous oxide and oxygen, nitrous oxide and oxygen plus ether or ether alone. Deep relaxation which will permit major abdominal operations and the reduction of fractures of long bones and dislocations of larger joints is extremely difficult to obtain even with the addition of ether to the mixture.

In 1923 Drs. Luckhardt and Carter after much experimenting with ethylene gas suggested its use as a surgical anæsthetic. Dean Lewis and W. E. Brown were the first to employ it, believing it to be a safe and satisfactory anæsthetic.

The gas was known to be explosive and this was emphasized by these early workers. A few small explosions with no injury to patient or anæsthetist occurred in the machines in some clinics. These were due to the static friction spark which at that time was but little understood and no safeguards were employed in the machines to cope with this danger. A most unfortunate and widely heralded fatal explosion charged to ethylene occurred later but as a matter of fact this occurred during an operation while nitrous oxide, oxygen and ether were being administered. Ethylene had been given to this patient during the first part of the operation. The profession was so frightened by this fatality that it has been tardy in employing this anæsthetic which to the minds of those who use it is most satisfactory and safe.

The modern gas machines are made to carry off the static electricity and ground it so that the danger of an explosion from the static spark is nihil. It is unsafe to use a cautery or free flame of any kind in the oper-

ating room during the administration of ethylene. The surgeon therefore, who employs it must forego the use of the cautery in gastro intestinal operations.

Another objection to its use is its disagreeable sweetish sorghum odor. This odor is not at all disagreeable to the patient however. The operating team soon become accustomed to it and the visitor to the clinic alone notices it.

These may be said to be the objections to ethylene—what about its advantages? They are many. Its ease and quickness of induction, its pleasantness to take, its quick awakening with the absence of postoperative retching and vomiting since carbon dioxide has been added to the mixture at the close of operation and the postoperative comfort and infrequent gastro intestinal complications are all in its favor. Relaxation can be obtained which will permit major abdominal operations and the reduction of fractures of long bones and dislocations of larger joints. It is rarely necessary to add ether to the mixture if local anesthesia is used, but a co operation between the anesthetist and the surgeon is most important to get this deep relaxation.

Ethylene does not stimulate the respiratory center. The respirations are smooth and regular and resemble those of normal sleep. There is not the stimulated labored respirations seen in nitrous oxide and oxygen and ether. The skin is closed and dry, and the patient's color remains pink if the proper mixture is used. If too much ethylene is given the patient becomes pale, the respirations shallow, and the pulse slow. Addition of more oxygen to the mixture will revive the patient quickly. After the period of induction the oxygen may be increased 15 to 20 per cent and as 20 per cent equals the amount of oxygen in the air, there is enough for thorough oxygenation of the blood during the anesthesia. Cyanosis is

absent even though deep relaxation may be required.

There is no excessive secretion of mucus during the period of anesthesia, and for this reason it is questionable whether the preoperative use of atropine is necessary. The awakening from ethylene anesthesia is prompt and without excitement so commonly seen in nitrous oxide and oxygen and ether.

Ethylene is an ideal anesthetic for the poor surgical risk handicapped by cardiovascular, pulmonary, or diabetic complication. As it has little if any effect on blood pressure it is especially valuable as an anesthetic for the badly injured. In thyroid surgery it is especially recommended. The absence of mucus and the quiet respirations make it extremely safe and any disturbance of respiration during operation for goiter can be charged to the surgeon's manipulations and not to the anesthetic.

Reports from surgeons who have made so bold as to employ ethylene continually in their work show a great reduction in postoperative pulmonary and gastro intestinal complications and in their general operative mortality rate.

These are some of the safeties and advantages of ethylene anesthesia. Surely if a comparison be made, these safeties and advantages will be found to far outweigh the objections and dangers. DONALD GUTHRIE.

MEETING OF THE SEVENTH INTERNATIONAL DENTAL CONGRESS

THE relationship of dental infection to systemic diseases and the rôle that dentistry now plays in preventive medicine were emphasized by the meeting of the Seventh International Dental Congress which has just been held in Philadelphia. There in one of the old buildings which was used at the

Centennial Exposition over 50 years ago, over 10 000 dentists had gathered from every country where dentistry is practiced. It was beyond question the greatest meeting of dentists ever held in this or any country, and no doubt many years will pass before it can be duplicated or surpassed.

It should be borne in mind that the importance of this meeting was accentuated by an act of Congress. On April 28, a bill was signed by President Coolidge which authorized an expenditure of \$5,000 to aid in securing delegates from foreign countries. The official stamp placed on the meeting by Congress accounted in great measure for the large attendance.

More than 400 papers were presented at the meeting, and there were approximately 1200 speakers. There were also from 800 to 1000 dry clinics presented, and these represented every known topic of interest to dentists. The papers and discussions on teeth as foci of infection probably created the most interest, and the result will be a better understanding of the dentist's responsibility in the elimination of dental infection, and its prevention. The papers presented on this subject clearly demonstrated that dentists are recognizing the

importance of co operation with physicians in order to give their patients better care. More patients will be sent to hospitals for the extraction of teeth, and the risk of this operation will be estimated as for any general surgery. Moreover, by such co operation, the dentist will be in a better position to select the anæsthetic, and to decide when it is necessary to extract all questionable teeth. It is generally recognized that many teeth have been extracted needlessly but from the standpoint of a menace this is a drop in the bucket as compared with the tremendous amount of infection that is retained in mouths for the purpose of facilitating restorative work.

The epoch making work of Rosenow and others on elective localization, aided by the generous use of the roentgen ray, has accounted largely for the change that has taken place in the practice of dentistry. The dentist is now expected to take an active part in the practice of general medicine. Requirements for admission to dental colleges have been raised, and undoubtedly as a result a greater number of high grade men will study dentistry. It follows that the teeth will be better cared for in future generations than in the past.

BOYD S. GARDNER

MASTER SURGEONS OF AMERICA

JOHN ASHHURST, JR

JOHN ASHHURST JR, M D, LL D, was born in Philadelphia, August 13, 1839. He was of English extraction and of a family well known in the intellectual and social life of his native city. His preliminary education was conducted at home under tutors, and finished at the University of Pennsylvania where his record for scholarship still stands conspicuous in the annals of the College. He studied medicine in the same institution under the preceptorship of Joseph Carson, the professor of materia medica graduating in 1860. Following this came a year's service as interne at the Pennsylvania Hospital the oldest hospital in the United States and then as now one of the most important hospitals of the city. Here he came under the influence of George W. Norris and Joseph Pancoast two of the strong men of their day. Pancoast was professor of anatomy in the Jefferson Medical College, and perhaps the most brilliant operator Philadelphia has ever seen.

When Ashhurst entered practice the Civil War was beginning and like most of the young medical men of the day who afterward attained eminence he entered the service and served until the end of the war as a contract surgeon in the hospitals in and near Philadelphia. It was probably this experience in military surgery which early centered his interests on lesions of the bones and joints and blood vessels.

During the same period in 1863 he was elected surgeon to the Episcopal Hospital. Although this hospital was situated in what was then a remote locality, and rather inaccessible by reason of poor transportation facilities, the supply of clinical material was abundant. It was here that Ashhurst built up his reputation as diagnostician and operator, as de Nancrede did later.

At the same time his literary ability was demonstrated in a number of important contributions which familiarized his name to the surgical world at home and abroad. During this period he wrote his classical articles on shock, cerebral concussion and hæmorrhage and on surgery of the spine, edited the American edition of Erichsen's *Surgery* and produced the first editions of his very successful and widely quoted textbook on surgery. Most of his special articles during this period appeared in the *American Journal of the Medical Sciences*, or Hays' journal, as the older generation often called it. In the same journal appeared many discriminating book reviews over his initials.



JOHN ASHHURST JR
1839-1900

He was called to the chair of clinical surgery at the University of Pennsylvania in 1877. Agnew was then the professor of surgery. At that time the pre-eminence of Philadelphia as a medical teaching center was unchallenged, as Cushing has recently emphasized. The faculty of the University in the seventies and eighties was probably the strongest body of teachers in its history. It was an age of individualists, and the list included besides Agnew and Ashhurst such names as Leidy, Pepper, Duhring, Wormley, H. C. Wood, Tyson, Goodell, R. A. F. Penrose, and Wm. F. Norris. In 1877 the great Gross was still teaching at the Jefferson with Brinton as his associate, while T. G. Morton and John H. Packard were at the Pennsylvania Hospital and the younger Gross and Keen were forging to the front. Agnew was in his zenith as brilliant operator and popular practitioner, while Ashhurst typified the scholar in surgery, a fortunate combination for the students of the school.

To his teaching duties and his position as surgeon to the University Hospital Ashhurst added those of surgeon to the old Children's Hospital and later the Pennsylvania Hospital. His surgical reputation was greatly enhanced by his editorship of the *International Encyclopedia of Surgery* (1880-1886), the contributors to which included the best known surgeons of the United States and Europe. A French edition of this work, with introduction by Gosselin, appeared shortly afterward. Ashhurst's contributions included the articles on amputations, excisions and resections, and intestinal obstruction. This great system made Ashhurst's name as familiar in Europe as it already was in America, and he became generally recognized as the greatest authority in the world on surgical bibliography. Brinton called him the most learned surgeon of his day. He was the friend and correspondent of Ollier and Esmarch and of Adams, Gant and Estlander. By reason of his contributions to surgery of the bones and joints, Otis ranked him with Billroth and Volkmann, and Gurli and Legouest. F. R. Packard says he was the most learned man he ever knew.

Ashhurst succeeded Agnew as John Rhea Barton professor of surgery in 1888, when the latter retired from practice, and held the chair until his death. J. William White succeeded to the chair of clinical surgery, but Ashhurst continued his clinical teaching along with his didactic teaching. He was a firm believer in the value of didactic teaching. As a lecturer he was systematic, thorough, scholarly, always master of his theme and of himself, and while closely following the written page, his knowledge of surgical history and literature, and his wide clinical experience enabled him to illuminate his subject with a wealth of interesting comments. He had a fine gift of sarcasm when he chose to exercise it, which was but rarely in his public utterances.

As an operator he was deliberate, painstaking and unruffled. He paid great attention to the after treatment of his operative cases. He was a good gross pathologist. His great diagnostic ability and fine surgical judgment outshone his

reputation as a craftsman. But he was the best of plastic surgeons. Harte his close friend and biographer, and himself a fine surgeon in this difficult field ascribed Ashhurst's success in the complicated procedures of facial surgery to his taste for mathematics which was one of his recreations.

The students feared him somewhat as an examiner, as he was a strict but very just and conscientious marker. They respected him greatly as teacher and man, and at a time when medical students were a rather turbulent body, he remarked in his quiet way that he was never troubled with disorder in his classroom. To his assistants and internes he was dignified, but considerate and friendly, and often laid aside his natural Anglo-Saxon reserve with those he liked and trusted, and then revealed a keen if quiet humor which they greatly appreciated. As assistants, our devotion to him was unmeasured. He was entirely lacking in the smallness which sometimes impedes the upward progress of juniors in the profession. He was deeply interested in young men and their progress. Many there are of us who owe our start in surgery to his encouragement and influence.

Among his assistants who have passed were Harte, Wharton, Le Conte and G. G. Davis, while Deaver, Neilson, Howard Kelly, John G. Clark, Bloodgood, J. P. Hutchison, Girvin and Henry Norris are among those who were associated with him as assistants, or internes.

Steeped in the best traditions of the profession, he was an authority on the ethics of medical practice. While habitually reserved in manner, he had within a vivid human side, and a temper which, usually under firm control, could flame to a white heat at acts which he considered unprofessional, unjust or dishonorable. The best revelation of his character is perhaps afforded by a perusal of the memoirs of his friends, James H. Hutchinson the internist, Wormley the chemist, and others prepared for the College of Physicians, and in his addresses to students at opening exercises, commencements and similar occasions. These are models of style, taste and sympathetic insight.

With Ashhurst's training, position and tastes, it was natural that he should early assume a leadership in the councils of the College of Physicians, that unique medical society in Philadelphia whose traditions, methods of procedure, and control have been compared with those of the Royal College of Surgeons. One of the oldest medical societies in the country, and a very conservative body, it also possesses one of the largest medical libraries in the world, rich in incunabula, and other valuable editions and a wealth of memorabilia besides. Osler took a deep and lasting interest in the College and its library, and said while tracing its influence: "The social force and influence which physicians have always exercised in Philadelphia is not a little peculiar, and there is much truth in the statement that 'he is, and always has been, relatively a more important person here than elsewhere.'" To this influence the College has contributed in large measure. Ashhurst naturally turned to the College as one of his greatest interests. Long

influential in its Council, he succeeded J M Da Costa as president in 1898, only a few months before his final illness. He was one of the original Fellows of the American Surgical Association, and its vice president in 1896. He was a vice-president of the Philadelphia Academy of Surgery, a president of the Pathological Society, and a member of the American Philosophical Society. He was an LL D of Lafayette College.

Ashhurst was a devoutly religious man, a prominent layman in the Episcopal Church, and a manager of the Episcopal Hospital. In his earlier life he was a keen book collector, and he possessed a large and valuable library, rich in medical and surgical works, medieval and modern, and in the classics, which he was fond of reading in the original tongues. Much of his medical library was devised by him to the College of Physicians. He married Sarah Stokes Wayne, of the same family to which General Anthony Wayne belonged, and of their seven children two studied medicine, the surviving one being Astley P C Ashhurst, the surgeon. Another son, John Ashhurst, 3rd, is the chief librarian of the Free Library of Philadelphia.

Doctor Ashhurst continued his practice and teaching until 1898, when he suffered a cerebral hæmorrhage resulting in hemiplegia, which incapacitated him for 2 years before his death. He died July 7, 1900.

JOHN H JOPSON

TRANSACTIONS OF SOCIETIES

TOUR OF THE AMERICAN GYNCOLOGICAL CLUB, SUMMER OF 1926

TO GERMANY, DENMARK, SWEDEN, NORWAY, SCOTLAND AND ENGLAND

BY FRANKLIN H. MARTIN, M.D., F.A.C.S., CHICAGO

THE pilgrimages to Europe which are being made by members of the medical profession of the United States and Canada for purpose of clinical observation may eventually become a strain on the hospitality of the European clinicians but as yet there have been no evidences of this. On the contrary the cup of welcome has always been full to overflowing with generosity. However if we on our continent do not have an opportunity to reciprocate in kind to our friends of Europe, and demonstrate to them how well we are utilizing the information that they have so abundantly bestowed upon us the time will come when our obligation to them will be too great. May we not become even a little sensitive by interpreting (if we were not already convinced to the contrary) this lack of reciprocation as being due to want of appreciation of the fact that we too are progressing and that we too may have some thing of interest to show?

No one who has not made one or more of these trips to observe the work of his confrères abroad can appreciate the value of these visits in broadening one's views in regard to the work, the professional judgment and the interpretation of results attained by any particular individual or groups of individuals visited. It is much more difficult to interpret character through the writings or reputation of a man than through a face to face personal acquaintance. These travel observations are convincing evidence of fitness, honesty and judgment in professional conduct. Oftentimes there is a demonstration of the difference between a well written romance and an accomplishment observed at first hand. To an Editor, a personal knowledge of the surgical work of an operator is paramount in evaluating the practical worth of a literary communication from a given source.

The "show me" spirit has been developed more and more in the conduct of medical societies of North America. It began seriously in 1903, when the Society of Clinical Surgery was formed. This

was followed on a larger scale by the organization of the Clinical Congress of Surgeons of North America in 1910. The American Gynecological Club came into being in 1911. These earlier efforts have been imitated in great numbers by inter community visiting societies and inter state clinical societies, some smaller and informal and others larger and more formal with a broader range of travel. Among the latter a conspicuous example is the Tri State District Medical Association, more recently known as the Inter State Post Graduate Assembly of North America.

In 1911 a few months in advance of the organization of the American Gynecological Club the obstetricians and gynecologists of England, Scotland, Ireland and Wales organized the Gynecological Visiting Society of Great Britain, which, up to the present time, has confined its visits to the British Isles. However tentative plans now under way forecast the initial bow of this society on foreign territory through a visit to Canada and the United States during the summer and autumn of 1917. It is to be hoped that our visitors may find here much that will interest them, and I predict that the reception which will be accorded to them will repay this distinguished group of men for making what appears to them such a huge effort and such a long journey—a long journey that appears when taken by us so short so delightful, and so worth while.

The success of a trip for clinical study is dependent in a great degree, upon carefully laid plans which will not attempt too much and which will give time for observation and for recreation. The itinerary should be discussed well in advance by the different members of the group and the details of working out schedules, obtaining accommodations, and perfecting arrangements for sight seeing should be put into the hands of a reliable travel company which will furnish an intelligent courier to protect the travelers from all annoyances of customs which are foreign to them. Extensive advance correspondence with the clinics

to be visited, obviously, is necessary, as no clinics or clinicians should be included in the advance program from whom a cordial invitation has not been received

On three occasions the American Gynecological Club has visited Europe and the British Isles. In 1912, France, Germany, and Austria, in 1914, France, Switzerland, Germany, Scotland, and England, and in 1926, Germany, Denmark, Sweden, Norway, Scotland, and England. As a rule the men were accompanied by their wives and other members of their families, and this undoubtedly has proved a great factor in the success of the tours.

OUR ITINERARY

Early on the morning of June 29, 1926, the American Gynecological Club sailed from New York on the SS *Resolute* of the United American Lines. Our table seats and deck chairs had been reserved. Our trip across the Atlantic was without incident, aside from the extreme enjoyment of a reunion and comradeship of a group of old friends with whom we had adventured to Europe at least twice before.

We were due to arrive in Duxhafen and take a train for Hamburg (one and a half hours away) immediately upon disembarking. Hamburg gave us a glimpse behind the curtain of Germany, since it was rung down after the tragedy of war. It was much as before, with apparently the same efficiency of operation and normal prosperity.

Hamburg, Germany, July 8 and 9

Copenhagen, Denmark, July 10, 11 and 12

Lund, Sweden, July 13 and 14

Stockholm, Sweden, July 15, 16 and 17

Gota Canal, July 18, 19 and 20

Gothenburg, Sweden, July 21

Oslo, Norway, July 23 and 24

En route to Myrdal, July 25

En route to Flaam, Gudvangen, and Voss, July 26

Voss, Norway, July 27

Bergen, Norway, July 28

Crossing North Sea, July 29

Newcastle upon Tyne, Scotland, July 30

En route by automobile to Edinburgh, July 31

Edinburgh, Scotland, August 1 and 2

Through the Trossachs, August 3

Glasgow, Scotland, August 4

Liverpool, England, August 5 and 6

Disbanded in Liverpool on August 7

OUR HOSTS

Because of our past experiences, we anticipated a cordial reception, but our expectations were excelled everywhere. Our program, as arranged

in advance, was most attractive, but it was a mere outline that was amplified in each case as we finally enjoyed it. Everywhere attractive social entertainments were planned to emphasize local color, in the daytime for the ladies in particular, and in the evenings for our entire group.

Hamburg. While there was no advance program for our brief stay in this city, we were agreeably surprised to find invitations awaiting us from Professor Th. Heynemann, Professor E. F. Mueller, Professor Schottmueller, and Dr. Bilrich, who received us, made us welcome, and particularly pleased us by their selection of operations.

Copenhagen. Among our hosts were Professor S. A. Gammeltoft, Dr. Otto C. Aagaard, Professor E. Hauch, Professor E. Ehlers, Dr. C. Wessel, Dr. Grubdal, Professor O. Chevit, Dr. I. P. Hartmann, and Dr. Fenger Just.

Lund. Professor E. Essen Moller.

Stockholm. Professor H. J. Forssner, Professor E. Ahlstrom, Professor Dr. James Heyman, Professor E. Bovin, Professor Einar Key, Dr. G. Holmberg, Professor Dr. Gosta Forssell, Dr. Berven, and Dr. Wetterdal.

Gottenberg. Dr. Mannheimer, Dr. H. Benckert, and Dr. Hellstrom.

Vernamo. Dr. Torsten Rietz.

Oslo. Professor K. Brandt.

Bergen. Dr. L. Severin Petersen.

Edinburgh. Professor Benjamin P. Watson, Dr. A. H. Freeland Barbour, Dr. W. Fordyce, Dr. J. Haig Ferguson, Professor R. W. Johnstone.

Glasgow. Professor J. M. Munro Kerr, Professor S. Cameron, Dr. James Hendry, Dr. Hewitt, Professor J. H. Teacher, Dr. David Shannon, Dr. J. N. Cruckshank, Dr. Donald McIntyre, and Dr. Lennie.

Liverpool. Professor W. Blair Bell, Dr. Leith Murray, Mr. A. Leyland Robinson, Professor R. E. Kelly, Dr. Cunningham, and Mr. Woolfenden.

SUMMARY

When serious observers are privileged as guests to visit for three weeks the hospitals, operating rooms, laboratories, universities, and teaching halls of honest contemporaries in a foreign land, how meager is our ability to describe the experience in a way to interest a reader and to put him in the same sympathetic and admiring attitude toward each and every one of our hosts! We have been the welcome guests of some of the great teachers of the world. They have taken us into the very heart of their work, with great modesty and without apology, and they have said to us: "This is our way, these are our reasons, these are

our patients these are our methods and these are our results" If we found that the means to a common end were different from our own work in some unimportant details we also found them different among men of the same countries, or even among men of the same cities What we did find was that every day we were learning something in a way that could never be equalled by the perusal of books I doubt if there was one of us who was prompted to make invidious comparisons Every hour of every day we realized that we were privileged students because we were given opportunity for a face to face discussion with our teachers of the points at issue, we were privileged to see with our own eyes what they were doing and to hear with our own ears what they had to say And this invaluable privilege need not be unique it is open to all serious minded seekers after the truth The one sad feature that haunted us was the fact that our hosts do not manage to do unto us what we have done unto them This was not prompted by a feeling on our part that we may have something different to show them but by a desire to reciprocate by showing them what we have The scientific world is becoming more uniform more crystalized and its methods more standard While literature of necessity promotes records analyzes and preserves in permanent form the work of a surgeon the casual interchange of ideas in his workshop must result in a better understanding

We have the promise of visits to America within the near future of several outstanding teachers of Scandinavia There can be no doubt as to the welcome they will receive nor can there be doubt of the pleasure that we shall derive from making them feel at home We have a definite promise of an early visit of the Gynecological Visiting Society of Great Britain For them all we will with the aid of our Canadian confrères, polish up our best English and open wide our doors

OUR PARTY

The names of the members of the American Gynecological Club who were with us on this occa-

sion, and our invited guests, are appended below It must be admitted that not the least important factor of the success of our organization (and I believe of any sane organization) was the fact that we were accompanied by our wives and other members of our families Too great emphasis cannot be placed upon the great pleasure it was to all of us to have with us throughout our visit several of our grown children I say ours' because they were christened the daughters' and sons of the Club Their presence warmed our blood and enhanced our happiness They were Mary Osborn Polak, Dickie Smith, Katherine L. Kosmak, George W. Kosmak, Jr., Burton W. Taylor, and David Newton Danforth

The *esprit de corps* and the intimate good fellowship of a large family that develops in one of these long trips is not the least valuable feature of this form of travel Our more conventional hosts frequently remarked upon our intimacy of contact, and our custom of calling each other by our given names This we assured them was not a pose but the promptings of a close friendship akin almost to family intercourse To most of us I believe the formation of these close friendships is the unending asset of our association

J Wesley Boyce Wash- ington D C	Herbert M Little Montreal
Joseph Brettauer New York	Franklin H Martin Chicago
William E Caldwell New York	C Jeff Miller, New Or- leans
Robert L Dickinson New York	Reuben Peterson Ann Arbor
N Sproat Heaney, Chi- cago	John Osborn Polak, Brooklyn
Barton Cooke Hirst, Philadelphia	Frank F Simpson Abroad
Frederick C Holden New York	Richard R Smith Grand Rapids
J M Munro Kerr, Glasgow	Howard Canning Tay- lor New York
George W Kosmak, New York	George Gray Ward New York

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD MARCH 19, 1926, DR. DAVID S. HILLIS PRESIDING

ABSCESS IN RIGHT HORN OF UTERUS, AND
OVARIAN DERMOID ROTATED AND FIXED
BY OMENTAL ADHESIONS

DR. CAREY CULBERTSON The specimen presented is one of intramural abscess in the right horn of the uterus, developing about the interstitial portion of the tube. The patient was a young woman 30 years of age. I have not noted such a finding in over 800 cases of salpingitis operated upon.

The specimen of ovarian dermoid was taken from a woman, age 36, who came into the hospital complaining of severe pain in the right side of 3 weeks' duration. This patient had been operated upon some years earlier and then again in 1923 for gall bladder drainage. At the second operation, as far as could be ascertained, a drainage and not a cholecystectomy was performed. When the patient was admitted to the hospital, the pain was so severe that she could not stand up straight and it was accompanied by a pulling and dragging sensation. She was obese and not easy to examine, but the right side was extremely tender. A small fibroid of the uterus was palpated. A fixed, tender mass, about the size of a grapefruit, could be felt in the ileocecal region. At operation an ovarian dermoid cyst, the pedicle of which had been rotated one and one half times, was found on the right side. The omentum was densely adherent in the right upper quadrant and over the upper portion of the dermoid cyst, thus fixing it firmly in its twisted condition. The sigmoid flexure, the cæcum, and a loop of ileum were likewise adherent.

SQUAMOUS CELL CANCER OF THE CERVIX

DR. CARL HENRY DAVIS Mrs. M. L., aged 24, married 2 years, came in March 6, 1926, because of sterility. Her periods began at the age of 14, were always regular, of the 28 day type and lasted about 5 days with moderate flow and with slight cramps the first day. The last period occurred two weeks previously. The immediate family history was negative except that a maternal aunt died of cancer of the breast at the age of 32 and the patient's twin sister had been operated upon for exophthalmic goiter 4 years ago. She had no abdominal or pelvic pain but had been constipated since an attack of intestinal "flu" last summer. There had been a slight vaginal discharge for several months with a definite increase since the first of the year. Napkins were not needed. Her usual weight since marriage had been 100 but on examination it was 94½ pounds. The height was 5 feet 3 inches.

Physical examination showed head and mouth negative. There was moderate, uniform enlargement of the thyroid. The lungs were negative. The heart was not enlarged but had a systolic blow over the base. Breasts and abdomen were negative.

Vaginal examination showed external genitalia negative. The hymen would admit only one finger. Under nitrous oxide and ether anesthesia the hymen was dilated. The cervix had a small growth about ½ centimeter in diameter protruding from the right side of the cervical canal. The uterus was retroverted but normal in size. The adnexa were negative. The irregular growth was removed for microscopic examination and the base cauterized with the electric cautery. The pathological diagnosis was squamous cell cancer of the cervix.

The patient was sent to Columbia Hospital and a panhysterectomy was performed March 12, 1926. On the right side the ureter was exposed and lymph glands removed with the parametrium. On the left side the dissection was less extensive as the growth was entirely on the right side. The pathologist's report on the tissue removed at the time of operation was as follows:

'Region of cauterization is bare of epithelium and shows in places superficial coagulation necrosis with slight leucocytic infiltration. The superficial tissue also shows mild edema. At one edge of the defect the squamous epithelium stops rather suddenly as at an ulcer edge and is practically normal in appearance. Lymph nodes show mild chronic inflammation in the form of enlargement of cells of reticulum or lining lymph sinuses. The cells are large and pale and have not the appearance of tumor cells.'

DEATH IN A PREGNANT WOMAN DUE TO A RE-
TROPERITONEAL RUPTURE OF A SMALL
ANEURISM OF THE SPLENIC ARTERY

DR. W. C. DANFORTH Patient was 28 years of age and was in the seventh month of her second pregnancy. She was delivered 2 years previously by the author without incident. One afternoon about 3:30 her blood pressure was 110. About 6:30 the same afternoon she suffered severe abdominal pain. She was seen 20 minutes later and presented all the signs of hemorrhage with acute anemia. The area over the uterus was quite tender to pressure. At first glance one would think of a separation of the placenta, but the physical signs of this were absent and the child was alive. She was brought to the hospital given morphine, and kept quiet.

During the night she had another attack of pain, and the following morning was intensely anæmic. There was still no change in the size of the uterus. It was thought that possibly she might have had a separation of the placenta but with less hemorrhage than ordinarily would produce such intense signs of shock. It was apparent that the child was dead, and the uterus was rapidly emptied. No hemorrhage was found. Transfusion was done. She rallied for a few hours but by night became rapidly worse and died.

The autopsy showed the cause of death to be a retro peritoneal rupture of a small aneurysm of the splenic artery with an enormous retroperitoneal hemorrhage

ABSENCE OF THE UTERUS

DR W E NEWMAN DORLAND The patient 23 years of age had been married 13 months. She had never menstruated. On examination I found the woman apparently normally developed with a full growth of axillary and pubic hair. The breasts were perfectly developed. She had what appeared to be a vagina large enough to admit the little finger. There was no urethral orifice visible in the genitalia. Examination showed a small urethral orifice midway on the anterior wall of this so-called vagina out of sight but to be felt within. Rectal examination showed a complete absence of the pelvic viscera and uterus. The abdominal and rectal fingers came in contact without any trouble. I believe ovaries were present. The patient stated that she had a desire for the marital relation but there was absolutely no satisfaction. There was no clitoris.

This case comes under the group of absence of the uterus. The opening of the urethra on the anterior wall of the small canal was of interest.

PREVENTION AND RELIEF OF PROLAPSE UTERI

DR ROLAND S CROW of Milwaukee Wisconsin, read a paper by invitation entitled Prevention and relief of prolapse uteri. (See page 698)

DISCUSSION

DR C W BARRETT As a primary cause of prolapse of the uterus we have the unfortunate fact that women walk on their hind legs in an upright position with the genital opening the lowest part of the abdominal cavity. Four footed animals have no such tendency to prolapse though with the bad position of farm animals there is a light tendency for them to have prolapse. In the male the lower wall of the abdomen is much better taken care of. In the female it is fairly well taken care of were it not for the fact that childbirth comes along and displaces these structures. Once in a while there is a woman with a prolapse who has not had a child. As the head has to pass into this narrow space the levator ani instead of being a help to childbirth as the older obstetricians taught is decidedly in the way. That is of course recognized more in episiotomy. I have not found episiotomy so entirely satisfactory in the repair but since exposing the muscle that is torn and uniting it definitely as we would in a gynecological operation I have been much more satisfied with the pelvic floor repair.

In exposing those muscles for repair we are doing just what we do in any wound. The muscle is practically always injured to some extent. It is either extremely dilated elongated or torn or both

and we do not expect it to be quite as good for support as it was before. If it is not good for support it should be repaired. If it has not been badly injured a good deal depends on the innervation. I think we would see much less prolapse if we got a good innervation of the pelvic muscles.

When it comes to repair of the pelvic wall there are certain conditions that must obtain. We must make a good pelvic floor support and not something on the posterior vaginal wall. The muscles of the pelvic floor still have their circumference attachment but they lack the attachment between the rectum and the vagina. We must have the vagina in about a perpendicular line. We must do away with any redundancy of the vaginal wall.

It is not difficult to cure a moderate prolapse by having the uterus on top of the bladder. All we have to do is to have it out of alignment with the vagina. If we can keep the uterus from going down by planting it in between the bladder and vagina we can get a larger percentage of good results by having it in the normal relation of the body. There is a great advantage in having the uterus in a normal position above the bladder free to undergo the enlargement of childbearing. In women who have passed the childbearing period the larger number would be better if the uterus were taken out. There seems to be a false idea that the bladder is going to support the uterus and the uterus is going to support the bladder. Neither one of them is a supporting structure. If we take the uterus out all those ligaments go back into the abdomen and leave the vagina unattached and we have increased the patient's chances of having a falling of the vagina and bladder. If we take the uterus out and use the ligaments that we detached from the uterus to attach to the vagina, we lessen the tendency to prolapse.

DR W McI THOMPSON The interposition operation is fine in selected cases for women who have passed the childbearing period. This operation will easily block the prolapsing vagina.

DR W C DANFORTH Follow up examinations show that a properly done episiotomy is a conservative and very useful procedure. It is not useful however unless one sections some of the muscle which is going to be injured that is the muscular tissues of the pelvic floor. We must section them so as to get enough room for the head to come through so that further tearing does not occur. The recognition of the structures that have been sectioned is not difficult nor is the reuniting at all difficult.

My own experience with the interposition operation in properly selected cases has been exceedingly satisfactory.

Another procedure which he did not mention and which emanated from the same source as the interposition operation namely Dr Watkins is the use of the lower portion of the broad ligament which may be advanced on the lower part of the uterus. Many of our cases are handled very satisfactorily by this technique.

DR CAREY CULBERTSON Procidencia uteri is seen most frequently in two types, the thin, under nourished, long waisted type and the soft flabby type. While episiotomy is very advantageous in certain cases, I do not believe that it will prevent procidencia subsequently in women of these types, if they go on having children. In other words I follow Dr Cron in his emphasis upon the type as being the determining factor, the obstetrical factor being of second importance.

As an operation for cystocele it is extremely satisfactory. The chief criticism that I would make of the report is that there were 225 of these operations in 275 cases but we are not to assume, of course, that this is the only operation that was performed for procidencia. I do not employ the Watkins operation when the uterus comes out of the vagina. Not every uterus can be handled in this way. Some are too large, either from the presence of fibroids or from subinvolution, some are too small. Sometimes in a senile woman the atrophy is so great that the organ is of no value for the operation. If the uterus is not too small or too large for cystocele transposition has been found to be a very satisfactory operation indeed.

There is another operation which was not mentioned that is very satisfactory in elderly women and that is the one devised by LeFort in which the anterior and posterior vaginal wall are denuded and sutured together. The operation is extremely simple and can be done under local anesthesia or ethylene gas and is attended with very mild, if any, reaction.

DR CARL HENRY DAVIS Dr Cron has followed up 225 interposition operations performed by 13 different men. There was a total mortality of 2, which is less than 1 per cent. The average age of the patient was 54, there were a number of patients who were approaching 70 and 2 who were past 70. I do not know of any other operation for the types of conditions listed which could have been performed with as low a mortality and certainly none with as satisfactory results.

As far as the third degree prolapse cases are concerned I would agree with Dr Culbertson. Dr Baer and Dr Danforth in regard to those elderly women with very small uteri. With the larger uteri I would beg rather to differ for the simple reason that we can reduce the uterus to such a size that it will act as a tampon to the supporting structure. I performed 13 operations in the group reported and 2 of the most satisfactory were on patients with complete eversion of the vagina both with very large uteri. One was a woman whose muscles were so flabby that had the uterus been removed I do not believe that any other operation including that suggested by Dr Culbertson, would have kept everything from pushing down. However by a reduction in the size of the uterus by interposition and by building up of a good perineum, it was possible to get a satisfactory result. The other patient was a very large woman. Some 4 inches of the cervix were removed and 2 years after operation the uterus was as large as that of a multiparous woman. The day after this patient got home from the hospital

she ran a half block carrying her 9 year old daughter who had been run down by an automobile. Later she showed some evidence of high rectocele. This was subsequently repaired by a secondary operation.

DR C S BACON Dr Cron spoke of prevention and mentioned only episiotomy. I presume he did not mean to convey the impression that that was the only thing that could be done to prevent prolapse. I think attention should be called to the fact that proper management of both the first and second stages of labor is of the utmost importance. Episiotomies in 53 per cent of normal labors is a large number. Dr Davis has said that in his experience only 1 of a large number of cases failed to heal. I would like to know if Dr Cron can give the same report. I think among ordinary operators the percentage of failures would be very much greater than that. I am not at all sure but that proper repair even after a small laceration, can be done just as well as an episiotomy. Episiotomy is desirable occasionally to prevent the tearing of the vulvar opening and very frequently involves only the accessory muscular tissues of the vaginal outlet, namely, the bulbocavernosus and the transversus perinei and does not involve the puborectal or pubococcygeal muscle. Here we usually have no difficulty in the repair. Much more important is the more extensive operation in which the branches of the levator ani are cut. This can often be avoided by patience. Spontaneous dilatation of the vagina by stretching these muscles will generally occur.

I do not believe that such a large percentage of cases of episiotomy need or would represent the practice of the average obstetrician.

DR R S CROW (closing) I was very much interested in Dr Barrett's discussion on repair of the perineum in preventing prolapse of the uterus, but I think that he has lost track of the fact that there are many patients who develop cystocele and prolapsus when no repair has been done or even in spite of an immediate repair. It is in these cases that we find it necessary to do some such operation as the Watkins operation. When such anatomical reconstruction can be done, I think it is very desirable. I wish all men knew anatomy as well as Dr Barrett does.

In regard to Dr Danforth's remarks on the limitations of this operation, I will grant that there are many cases in which the Watkins operation should not be performed. As you know, the failures were proportionately greater in women with third degree prolapse, especially when the prolapsed uterus was small and atrophic. I feel as the majority of men do that for this type of condition the use of the Watkins operation should be limited to moderate or first or second degree prolapse with cystocele. We have frequently used some of the other methods which necessitate removing the uterus and anchoring the base of the bladder and top of the vagina to the cardinal ligaments. I did not wish to convey the impression to Dr Danforth that I think the round ligaments are supporting structures. They merely direct the uterus.

In our experience practically all episiotomized perineums heal by primary union. I do not think that we have ever tried to cut the deeper structures of the pelvic diaphragm. The incision usually includes the skin, the urogenital septum or fascia, the constrictor vaginae, transversus perinei and the anterior fibers of the levator ani. Because of the excellent results we have obtained I feel that in the future we will do even more episiotomies.

PITUITRIN AT THE BEGINNING OF THE THIRD STAGE OF LABOR. A CRITICAL REVIEW OF TWO THOUSAND CASES

DR RUSSELL SCOTT read a paper entitled "Pituitrin at the Beginning of the Third Stage of Labor. A Critical Review of Two Thousand Cases. (See page 651.)"

DR C. S. BACON: When there is no sign of separation of the placenta from the uterus the personal equation comes in as the most important element in determining interference. If these cases were all managed by the same person we could better compare the results. I was surprised that expression was used uniformly in all cases. I do not know that we can accept these statistics quite at the face value on account of that personal element. One cannot make an expression of the placenta satisfactorily unless the uterus is contracted. Pituitrin makes a quicker contraction and can be followed by expression. That may be desirable if it really diminishes the amount of hemorrhage. I suppose it does make a little difference whether a woman loses 50 or 100 cubic centimeters of blood though a loss under 200 cubic centimeters is not generally of great importance. If those cases would terminate normally within 15 to 30 minutes without pituitrin it probably should not be used. When there is a delay pituitrin should be used. Its uniform use in all cases is questionable practice.

The number of manual removals of the placenta was 22 and 27 per thousand. That is a large number. In my student days under Jaggard he used to say that there were two manual removals in one thousand cases in Karl Braun's clinic. After I had had 2 manual removals in my first 3 cases in the County Hospital I realized that I must have 997 cases without this complication and I learned that proper management and proper expression sufficed in nearly all cases except those of placenta accreta.

DR W. C. DANFORTH: Dr Scott's figures bear out the impression which I have had from clinical observation that the third stage of labor is maternally shortened by the use of pituitrin at the end of the second stage. It has been my impression also that the amount of blood loss since we have been using pituitrin has been distinctly less. As regards the case

in which incarceration of the placenta occurred this woman was a patient of mine. Some years ago too long ago to have been included in Dr Scott's statistics I delivered this woman for the first time. At that time we were not using pituitrin routinely at the end of the second stage. Incarceration of the placenta occurred, requiring the use of ether to bring about sufficient relaxation for extraction. The same woman therefore had the same complication with and without the use of pituitrin.

The only completely accurate figures that I know of on the amount of blood lost during labor are those of a German observer who obtained the figures by conducting labors on a bed with a hole in the middle under which in a receptacle all blood lost might be collected.

DR HENRY W. LEWIS: I think there might be devised a method of getting a fair proportion of the blood by catching it in some sort of a vessel. Dr Barrett suggests using gauze pads. It seems to me there is a great chance of error in that way. The personal equation is so great that if a large number of people are engaged in the work a method should be devised that would give a more accurate estimate.

DR J. L. BAER: Heretofore I have treated placental removal as Dr Bacon does. If I understand the essayist there was routine placental expression. In most cases the placenta separates very readily after the completion of the second stage. If the uterus is allowed to retract in due course there is a simple expression. Pituitrin renders the uterus hard for a time. The obstetrician concludes that separation has occurred and he goes ahead with the expression. This is a questionable point that I think the essayist would like to discuss further. My own experience with pituitrin has been that when I have given it early after the termination of the second stage it seemed sometimes as if the placenta had become involved in the contraction of the uterus which held it rigidly in the lower uterine segment. In other words if I give pituitrin in the third stage it is as a prophylactic against hemorrhage rather than to hasten the expulsion of the placenta.

DR SCOTT (closing): I am very willing to admit that the amount of blood is apt to be wrongly estimated. This paper is a review of 2,000 cases and all the cases were not delivered by the men on the active staff of the Evanston Hospital. There were on an average 12 men delivering there. I think the operative percentages might not be the same if the work was all done by staff members.

I think Dr Hillis has said that shortening the third stage of labor after operative delivery is a great advantage. The patient is the one we have to think about. If the patient is back to bed that much sooner after an operative delivery she is in that much better condition.

TROTVLAE CVRANDARVM AEGRITV- DINVM MVLIBERIVM, ANTE IN, ET POST

PARTVM LIBER VNICVS, NVSQVAM ANTEA

*edidit, quo formae sexus accidentis morbi et passio et si sanum et perverum a partu
crua, moribus defectus, ac reliqua offe & abacta, d' inspectioni morique s' aut conda
grati, experimentis d' usque uariarum aegritudinum cum quibus
dam medicamentis decorandis corporis infirmitatibus, & doctum*

P R O L O G V S

VM auctor universitatis DEVS in prima mundi constitutione rerum naturas sin-
gulas iuxta genus suum distingueret naturam humanam supra ceteras creaturas sin-
gulari dignitate condidit. Hinc etiam supra aliorum animalium conditio ideo rationis
& intellectus libertatem dedit. Propterea volens eius generationem perpetuo subsi-
stere in loco dispari masculum & feminam creavit ut eorum fecunditas copagatio-
ne nunquam desineret emergere futura soboles. Quorum quidem complexioni grata
quodam commixtione contemperans naturam masculi calidam & siccam, femellae ve-
ro frigidam & humidam constituit. quia cuiusque alterius complexionis excessus mutua qualitas eo-
trinarum repugnantia coherceretur. adeo ut viri constitutus calida & sicca mulieris frigiditatem & humi-
ditatem. & contra humis natura frigida & humida viri complexionem calidam & siccam remulceret.
Similiter ut masculus qualitate fortiori dignus in mulierem tanquam in agrum semen effunderet, & etia
lier qualitate debiliore praedita tanquam viri officio subdita, semen effusum in gramen natura susce-
peret. Quoniam ergo mulieris natura sunt viri debiliores, hinc est quod in eis seminis abundans argumen-
tes, maxime circa membra operi naturae debita. Quia cum in loco secreti non accedat ipse propter utre-
cundam & condonionis frigiditatem, non audent angustias suarum aegritudinum medicis revellere. Qua
propter ego miseranda illarum calamitate, praesertim cum frigiditas maritum in infirmitate cepulis inceptis di-
gentur contemplari de aegritudinibus quibus ferminantur sexus sepissime molestantur. Cum itaque in mu-
lieribus non tantus abundet calor qui praeuocet & superfluos, qui in eis quotidie congregantur, sufficiat eo
fumere humores nec tantum laborem valeat earum debilitas tolerare, aut sudorem possit ad excutendum il-
los natura expellere. sicut in viris, ideo ipsa natura propter defectum caloris, ut praeproprium quandam
purgationem destinavit, scilicet coelstrum quae vulgi flores appellat. Nam sicut arborum non producent
sine floribus fructus, sic mulieres sine propriis floribus conceptionis officio defraudantur. Haec ante pur-
gatio contingit mulieribus sicut de nocte viris pollutio. Semper enim natura gravata quibusdam humo-
ribus siue in viris, siue in mulieribus, iugum suum nititur deponere & laborem minuere. Solet praeterea
huiusmodi purgatio mulieribus contingere circa decimum tertium vel quartumdecimum annum, vel pau-
lo antea vel paulo tardius, secundum quod in eis virgus vel minus abundat caliditas vel frigiditas. Durat
usque ad quinquagesimum annum si est macra, quoadque usque ad sexagesimum aut sexagesi-
mum quinquagesimum si est humida. in medio inter pinguis, usque ad quadragessimum quinquagesimum. Si autem de-
bito tempore & ordine contigerit talis purgatio exonerat se et cito et citius natura ad superfluos humores.
Si vero menstrua plus vel minus exierint, quam debeant plures aegritudines inde emergunt. Quoniam
inde minoratur appetitus tam cibique potus. Quandoque fit vomitus & quandoque appetunt ter-
ram carbonem cretam, & similia. Quandoque ex eadem causa dolor sentitur circa collum dorsum & in ca-
pite. Quandoque adest febris acuta cordis morbus, hydropsis, vel dysenteria. Haec autem contingunt vel
quia tempore longo deficiunt menstrua vel quia peioris non habent unde non solum hydropsis vel
dysenteria vel morbus cordis accidunt sed & aliae peiores aegritudines. Aliquando enim accedit diarrhoea
propter nimiam frigiditatem matris, vel quia uoce eius sunt multum graues ut in extenuatis mulie-
ribus quia tunc humores spissi & superflui non habent liberos matris per quos possint exire, vel
quia humores sunt spissi & viscosi, ideo propter conglutinationem, eorum exitus impeditur, vel quia
deliciose comedunt vel quia ex aliquo labore multum sudant. Sicut testatur Galeus. Mulier quae se no-
n exercet multum, necesse est quod abundet in multis menstruis, adhuc ut sana existat. Aliquando mulie-
rus deficiunt menstrua, quia in corpore earum coagulatus est sanguis vel quia sanguis per alia loca emi-
tuntur, ut per os, aut per nris, per sputum, aut haemorrhoides. Aliquando deficiunt menstrua ex nimio do-
lore vel ira, vel motu, vel timore. Si autem diu cessauerint, suspicandum grauius aegritudinis futurum arguit.
Nam una eorum utitur in ruborem vel in colorem loturque carnis recentis quandoque in humiditate,
vel liquiditatem, aut in colorem, quasi est color graminis, facies earum mutatur.

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED BROWN, M D F A C S OMAHA NEBRASKA

TROTULA THE DISEASES OF WOMEN

THE very name of Salerno calls to mind the picture of medicine and surgery struggling to regain their lost prestige in Continental Europe. To it came Constantine, the African, driven from Carthage by the threats of his enemies, bringing with him the knowledge of the Arabians. The city had been founded by the Romans many centuries before Constantine, and had become famous as a health resort and a shrine for pilgrims, for its cathedral held the bones of St. Matthew and the relics of the saints Thecla, Susanna, and Archelais. It was only natural that it should become the site of a school and in 802 A.D. one is thought to have been founded there by Charlemagne who was so active in trying to re-establish learning in Europe. This school was probably kept up by the Normans during the period of their rule in lower Italy, so by the ninth century Salerno had become one of the greatest universities on the continent. Because of its value as a watering place it was natural that medicine should be taught there and finally the "Collegium Hippocraticum" or Hippocratic College was formed to teach medicine. Among the earliest teachers were four men—a Jew Helinus an Arabian, Adala, a Greek, Pontus and a Roman, Magister Salernus. Each of these taught students of his own race in his own tongue. But before this there was a well known family, Ruggerio, in Salerno, which furnished many important citizens to lower Italy and finally from it there sprang the most famous woman of all early medical history. One must bear in mind that at this time medical practitioners of the male sex were restricted in their treatment of the opposite sex to generalized diseases and anything pertaining to disease of the generative organs, even obstetrics, was out of the province of the male physician. Hence the midwife was supreme in that field and it only remained for one of those who were known generally by the name of the Women of Salerno to make for herself a lasting name in medicine. This opportunity was grasped by a woman named Trotula. The exact time when Trotula, for the name continued for centuries among the women of Salerno lived is not certain. Her work appears in the Venetian Collection *Medici Antiqui Omnes, etc.* under the title "The First Book of Trotula Concerning the Cure of Diseases of Women, Before, During and After Delivery etc." It is probable that she lived during the

eleventh century and wrote her work before the arrival of Constantine for nowhere does she mention the Arabians in it. This is of course a matter of conjecture only, but the account of De Renzi in his *Scuola Medica di Salerno* setting the date of Trotula as during the time of the last Prince Longobardo but before the arrival of Constantine seems to be worked out logically and appeals to one as probably correct. According to him, Trotula was the wife of a physician, John Platearius the elder. That she was well known and equally well regarded by the men of her time is shown by the statement of one of the famous physicians of the eleventh century, Rodolpho Malacorona, who in the year 1099 said he did not find in Salerno one who could equal him "praeter quamdam sapientem matronam" except a certain learned matron who could have been none other than Trotula.

The most important work of this woman from the standpoint of surgery is the *Diseases of Women* noted above. In the Latin reprint it covers ten folio pages, beginning with a prologue in which she discusses the creation of the world (a common custom of beginning a book in those days to go back to the creation as a starting point) and the creation of man and woman with an elaboration of their different characteristics and functions. Then comes the body of the work which treats of gynecological conditions in more or less textbook style. This begins with the various abnormalities of the menstrual flow and proceeds to displacement of the uterus and finally to the consideration of the puerperal state, with its complications, etc.

Then, as now, efforts were made to prognosticate the sex of the fetus with about equal success in both periods. Trotula had a rule which she states thus:

In order to know whether the woman will bear a boy or a girl, take water from a spring and draw two or three drops of blood or milk from the right side of the woman and drop them into the water. If they sink she will bear a boy, if they float, a girl.

The work bears its greatest importance in that it contains the first known description of perineorrhaphy. This is advised for complete tear in which the vulva and anus make one foramen. Three or four silk sutures are inserted to draw the parts together. The wound is dressed and the patient put to bed with her feet higher than her head. There she remains for eight or nine days, after which she gradually resumes her duties.

1 Courtesy Dr. LeRoy Crummer Omaha Nebraska

REVIEWS OF NEW BOOKS IN SURGERY

IN a book called an introduction to the subject of X rays and radium¹, the elements of the physical and chemical phases of radio activity and radiology are presented in a manner suitable for use by students and others desiring an academic understanding of these agents. The construction of X ray apparatus and the tubing of radium and radon seem overemphasized to the American reader. The treatise supplies information leading up to the practical use of both. Discussions of the theories of radio activity, the theory of atoms and the biological effects of X rays and radium rays are well set forth.

A. J. LARKIN.

DEAEVER'S *Surgical Anatomy*² known so widely and favorably for 25 years now appears in a second revised edition. The actual text matter remains much as before although there is some rewriting and recasting of descriptions especially as this is necessitated by a new sequence of presentation. The account of the brain has been altered more than any other topic in the first volume. A certain degree of elegance is lost in the plates by the abandonment of the former buff background frames. It cannot be said however that the illustrations are perceptibly weakened in teaching value unless as is possibly the case an artistic effect enlists a sympathetic attitude.

There are two chief changes of policy in the new edition. The first is the introduction of the B. N. A. terminology—the English equivalents are inserted within parentheses following the primary use of the old terms. The second change involves a rearrangement of the text into a more logical and useful sequence. The first volume now comprises the surgical anatomy of the head including the brain, face, mouth, nasopharynx, eye and ear, the second volume will cover the upper and lower extremities, the neck, shoulders and back, the third volume will treat of the chest, abdomen, pelvis and perineum. The material is thus far more accessible than formerly. This work will continue to be a standard reference for the prospective and practising surgeon.

L. B. ARRY.

COKKINIS³ has prepared a monograph which embodies the results of a research on the subject of mesenteric vascular occlusion which occupies a decidedly unsatisfactory place in surgery. The work is based upon anatomical study in cadavers, experimental ligation in animals and the study of the records of 76 autopsies. The subject is covered

¹AN INTRODUCTION TO THE STUDY OF X RAYS AND RADIIUM. By HENRI A. COHEN. N. B. (Lo d.) de C. P. G. W. L. y. F. K. S. (Eng.) New York O. F. L. U. e. 1916.

²NEW SURGICAL ANATOMY OF THE HUMAN BODY. By JOHN B. DEE. M. D. Sc. D. L. D. F. A. C. S. 2d ed. vol. Phila. 1916. P. B. L. k. ton. S. & C. Co. y. 90.

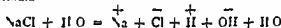
³MESENTERIC VASCULAR OCCLUSION. By A. J. COKKINIS. N. B. B. S. New York W. L. W. L. Wood. 1916. Comp. ny. 1916.

with a completeness of detail not ordinarily found in surgical texts.

In the summary the following facts are emphasized. Vascular occlusion is not an extremely rare disease. An obvious etiological factor plus the presence of an atypical obstruction associated with internal or external hemorrhage should usually suggest the diagnosis. With earlier and bolder operation the results of treatment should improve.

J. P. BUCHANAN.

IN an interesting monograph⁴ Rassers reviews somewhat briefly current theories regarding the pathogenesis of gastroduodenal ulcer and then advances a hypothesis of his own. He feels that solution of the ulcer problem is intimately linked with the following questions: How does the gastric mucosa withstand autodigestion? Where and how is the hydrochloric acid formed? He accepts the following explanation for the latter question namely that hydrochloric acid is formed through hydrolytic dissociation of NaCl according to the following formula:



The resulting NaOH being an alkali makes it impossible for the pepsin to digest the gastric mucosa. Thus in the physiological process of formation of HCl nature provides at the same time a protecting agent against autodigestion.

To put the hypothesis to experimental proof Rassers fed dogs a strictly salt free diet. After a few days of this diet their stomach contents showed no hydrochloric acid. He then introduced daily, by means of a stomach tube from 50 to 100 cubic centimeters of active pepsin solution. This was kept up for periods ranging from 40 to 100 days. All of the dogs showed at autopsy hemorrhagic erosions as well as chronic ulcers of the antrum, pylorus or of the duodenum. What happened here according to the author is that the gastric mucosa deprived of the protecting influence of NaOH could not resist the digestive action of pepsin.

Rassers agrees with K. H. Bauer as to the localization of chronic ulcers along the *magenstrasse* but does not accept his explanation that its vulnerability is due to its rudimentary character. He sees an explanation in the relative poverty of its blood supply. When as the result of some circulatory disturbance be it neurogenic or spasmogenic, one of the end arteries in the gastric mucosa is occluded an area of local ischemia results. Such an area will naturally lack NaOH and will therefore not be able to resist the digestive action of pepsin; the result is an ulcer.

GEORGE HALLERLIN.

⁴DIE PATHOGENESE DES CHRONISCHEN MAGEN- UND DUODENALULCERS. VON DR. MED. RASSERS. LEYDEN. 1916. 100 S. 1916.

Technique

The Suture & Ligature Journal



SURGEONS of international prominence are included in the list of those who have pledged themselves to help make **TECHNIQUE — THE SUTURE & LIGATURE JOURNAL** a factor in the advancement of surgical science

Written and edited by eminent surgeons who speak with the authority born of experience, **TECHNIQUE — THE SUTURE & LIGATURE JOURNAL** will be a valuable addition to your surgical library

In the United States, Canada or Great Britain a year's subscription is yours for the asking — elsewhere, \$3 00 a year Back numbers, 35c a copy



Research Division, C. DeWitt Lukens Company

4908 Laclede Avenue

Saint Louis, Missouri, U S A

REVIEWS OF NEW BOOKS IN SURGERY

IN a book called an introduction to the subject of X rays and radium¹ the elements of the physical and chemical phases of radio activity and radiology are presented in a manner suitable for use by students and others desiring an academic understanding of these agents. The construction of X ray apparatus and the tubing of radium and radon seem overemphasized to the American reader. The treatise supplies information leading up to the practical use of both. Discussions of the theories of radio activity, the theory of atoms and the biological effects of X rays and radium rays are well set forth.

A. J. LARKIN

DEWEES *Surgical Anatomy*² known so widely and favorably for 25 years now appears in a second revised edition. The actual text matter remains much as before although there is some rewriting and recasting of descriptions especially as this is necessitated by a new sequence of presentation, the account of the brain has been altered more than any other topic in the first volume. A certain degree of elegance is lost in the plates by the abandonment of the former buff background frames it cannot be said however that the illustrations are perceptibly weakened in teaching value unless as is possibly the case an artistic effect enlists a sympathetic attitude.

There are two chief changes of policy in the new edition. The first is the introduction of the B. N. A. terminology—the English equivalents are inserted within parentheses following the primary use of the old terms. The second change involves a rearrangement of the text into a more logical and useful sequence. The first volume now comprises the surgical anatomy of the head including the brain, face, mouth, nasopharynx, eye and ear; the second volume will cover the upper and lower extremities, the neck, shoulders and back; the third volume will treat of the chest, abdomen, pelvis and perineum. The material is thus far more accessible than formerly. This work will continue to be a standard reference for the prospective and practicing surgeon.

L. B. AREY

COKKINIS³ has prepared a monograph which embodies the results of a research on the subject of mesenteric vascular occlusion which occupies a decidedly unsatisfactory place in surgery. The work is based upon anatomical study in cadavers, experimental ligation in animals and the study of the records of 76 autopsies. The subject is covered

AN INTRODUCTION TO THE STUDY OF X RAYS AND RADIUM. By H. C. A. C. Clark, M. B. (Lond.) and G. C. Clark, F. R. C. S. (Eng.) N. W. C. O. Ford, v. 1. 1918. 96 p.

²SURGICAL ANATOMY OF THE HUMAN BODY. By J. B. Dewees, M. D. Sc. D. D. F. A. C. S. 2d ed. vol. I. Philadelphia: P. B. K. & Co. 1918. 96 p.

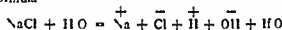
MESENTERIC VASCULAR OCCLUSION. By A. J. C. C. Clark, M. B. B. S. New York: William Wood and Company. 1918. 96 p.

with a completeness of detail not ordinarily found in surgical texts.

In the summary the following facts are emphasized. Vascular occlusion is not an extremely rare disease. An obvious etiological factor plus the presence of an atypical obstruction associated with internal or external hemorrhage should usually suggest the diagnosis. With earlier and bolder operation the results of treatment should improve.

J. R. BUCHHEIMER

IN an interesting monograph⁴ Rassers reviews somewhat briefly current theories regarding the pathogenesis of gastroduodenal ulcer and then advances a hypothesis of his own. He feels that solution of the ulcer problem is intimately linked with the following questions: How does the gastric mucosa withstand autodigestion? Where and how is the hydrochloric acid formed? He accepts the following explanation for the latter question: namely, that hydrochloric acid is formed through hydrolytic dissociation of NaCl according to the following formula:



The resulting NaOH being an alkali makes it impossible for the pepsin to digest the gastric mucosa. Thus in the physiological process of formation of HCl nature provides at the same time a protecting agent against autodigestion.

To put the hypothesis to experimental proof Rassers fed dogs a strictly salt free diet. After a few days of this diet their stomach contents showed no hydrochloric acid. He then introduced daily by means of a stomach tube from 50 to 100 cubic centimeters of active pepsin solution. This was kept up for periods ranging from 40 to 100 days. All of the dogs showed at autopsy hemorrhagic erosions as well as chronic ulcers of the antrum pylori or of the duodenum. What happened here according to the author is that the gastric mucosa deprived of the protecting influence of NaOH could not resist the digestive action of pepsin.

Rassers agrees with K. H. Bauer as to the localization of chronic ulcers along the *magen trasse* but does not accept his explanation that its vulnerability is due to its rudimentary character. He sees an explanation in the relative poverty of its blood supply. When as the result of some circulatory disturbance be it neurogenic or spasmogenic one of the deep arteries in the gastric mucosa is occluded an area of local ischemia results. Such an area will naturally lack NaOH and will therefore not be able to resist the digestive action of pepsin; the result is an ulcer.

GEORGE HALPERIN

⁴DE PATHOLOGIE DES CHRONIQUES MACRODARMOGESCHWÜREN. NERSTENIGER BEW. BEUNDEUNG DER FRAGEN DER NAL. OBEREN DER NAL. FÜR DR. J. R. F. Rassers. Leyden: C. Van Doesburg. 1918. 96 p.

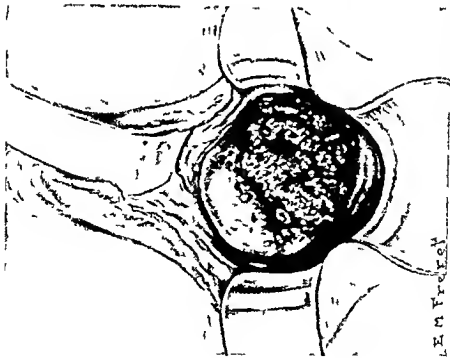


Fig. 1 (Pecunia No. 3649). Cancer of the cervix before irradiation. Bilateral laceration of the cervix cystic degeneration of the anterior lip and cancer of the posterior lip

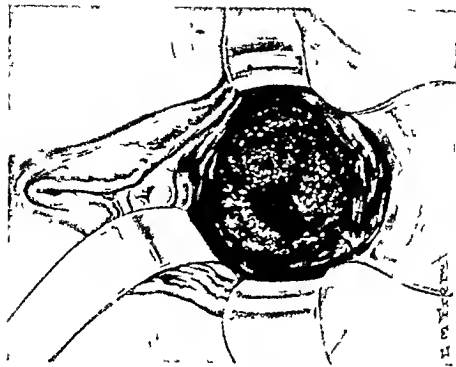


Fig. 2. Cancer of the cervix 1 week after irradiation. Intense hypotonia of the uterus

Reaction of the Tissues to Radium in Treatment of Cancer of the Cervix — Lili in A. P. Firsirot

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE, PUBLISHED MONTHLY

VOLUME XLIII

DECEMBER 1926

NUMBER 6

THE REACTION OF THE TISSUES TO RADIUM IN TREATMENT OF CANCER OF THE CERVIX AND THE IMPORTANCE OF LACERATIONS IN PRODUCING CANCER IN THIS LOCATION¹

By LILIAN K. P. FARRAR, A.B. M.D. F.A.C.S. NEW YORK

From the Clinic of the Woman's Hospital in the State of New York

IN THE Woman's Hospital in the State of New York, all ward patients with cancer of the cervix who have been treated with radium are urged to return for inspection once each month for a period of 5 years or longer. In the cervix the reaction to radium treatment is so nearly uniform that we believe we know what the appearance of the cervix will be each month if the case is progressing favorably, and that we can tell when the expected effect of radium has not been reached and a subsequent dose is needed. In order that we might fully appreciate the changes taking place in the cervix after irradiation, the medical artist, Miss Emily Freret attended the follow up clinic each week and made a series of sketches in water color. A sketch was made of the cervix before the patient received radium treatment and at each successive visit of the patient to the clinic. In this way it has been possible to show a case of cancer of the cervix in its natural color and the progressive alterations through which carcinoma of the cervix passes after irradiation together with the color changes in the cervix. The visits to the clinic were sufficiently far apart to show definite stages in the progress made by radium treatment. Five stages were noted.

A stage of hyperæmia One week after the initial dose of radium has been given the tis-

sues of the cervix, including of course, the carcinoma and the adjacent mucosa of the vagina are intensely red and hyperæmic. The blood vessels are engorged with blood and it is for this reason that we do not consider that a case should be radiated if an immediate operation is imperative.

A stage of slough One month after irradiation the cervix usually shows an extensive green slough and a foul discharge from the broken down carcinomatous tissue. We believe that this slough must have entirely separated from the cervix before hysterectomy can be performed without great danger of peritonitis resulting from cutting into this necrotic tissue. We do not mean to imply that every case progresses at exactly the same rate of speed even when favorable results are obtained. Occasionally patients come to the clinic a month after leaving the hospital and there is no indication clinically of slough or carcinoma, the cervix having healed more rapidly than in the average case, while others may present a slough 2 months after the patient has left the hospital or possibly, though this is rare in favorable cases, a part of the slough may still be present on the following visit.

A stage of healing Usually the third stage, that of healing, is reached 2 months after

¹Read before the American Gynecological Society in Stockbridge, Massachusetts, May 20, 1926.

radiation. The appearance of the cervix is now completely changed as the slough has separated leaving a smooth clean dusky red cervix which may be somewhat glazed but has clinically no evidences of carcinoma.

A stage of contraction. The following month should show the fourth stage which is contraction. The development of connective tissue which is excited by irradiation markedly reduces the size of the cervix and also the vault of the vagina. Large carcinomatous growths or even craters are contracted by the irradiation to a normal or smaller than normal sized cervix and the vault is as narrow as that seen in senile vaginitis.

The selective and also destructive action that radium exercises upon cancer cells either destroys outright or stuns some of the cells but the principal inhibiting action of radium on cancer is in the stimulation to growth of new connective tissue. The connective tissue enmeshes the cancer cells, shuts off the blood supply and starves the cancer by forming a barrier zone and thus imprisons its victim for a period that may be long or short. Only time can tell the extent of this period.

The stage of marked contraction. At later visits of the patient to the clinic the fifth or final stage of marked contraction is evident. The increasing amount of connective tissue squeezes the tissues of the cervix until it is finally so shrunken that we are often asked if the cervix has been amputated. There is now little or no vault to the vagina and the mucous membrane is pale with only an occasional blood vessel in sight. It is not until this stage has been reached that we are satisfied with the reaction of the cervix to radium. On the road to this goal we find at times that progress seems to have stopped and a second dose of radium is needed but usually the dose is less than the first and frequently only one or two needles of radium are necessary to check a nodule budding out in the cervix or vaginal vault.

It happens not infrequently when the cervix is small and shrunken and the internal os is tightly closed that the patient who has been making favorable progress up to this time now appears in the clinic looking pale perhaps septic and complains of abdominal pain

or uterine cramp that even morphine has not relieved. A dilatation of the cervix gently performed is almost always followed by a gush of purulent or bloody fluid from the body of the uterus with immediate relief and improvement in the general health of the patient. This treatment may have to be repeated once or twice especially in young women in the menstruating age.

When inspecting the cervixes invaded by carcinoma we have been impressed by the frequency with which lacerations were present in the cervix and decided to study 300 of our consecutive case histories of cancer of the cervix to determine the incidence of pregnancy in this series of cases. In 288 of the 300 cases 96 per cent pregnancy terminating with children or miscarriages had occurred. In only 12 cases 4 per cent had no pregnancy occurred. It is not improbable that this last figure (4 per cent) would be even lower if we could retake old histories for a more careful history taken in 3 recent cases revealed the fact that 2 of the 3 patients classed as nulliparæ had borne children and in the third case a miscarriage had occurred at the second month. In a review of the medical literature Liepmann reports that cervical carcinoma in nulliparæ was found by Kroemer to occur in only 1.77 per cent of cases, by Koblauch in 4.6 per cent and by Theilhaber and Edelberger in 2.9 per cent.

It is of interest to note that in a series of 50 cases of squamous cell carcinoma of the cervix collected by Dr. Cullen of Baltimore 49 of the 50 patients had borne children and at least half of the patients were mothers of 5 or more children. In 288 of the case histories just reviewed in the Woman's Hospital 115 patients had had 5 or more pregnancies and 35 of the 115 had had 10 to 23 pregnancies. It would seem that repeated traumatization of the cervix by labor or miscarriage might be an important influence in the series of changes terminating in carcinoma.

Dr. Cullen also states that Dr. Howard A. Kelly has seen only 3 nulliparæ who had carcinoma of the cervix and in 1 of these an instrumental dilatation had been previously performed. Dr. Cullen believes that traumatization by instrumental dilatation of the

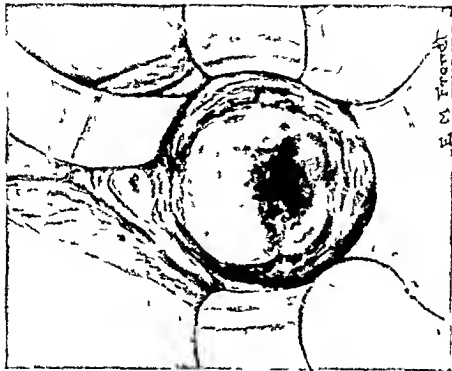


Fig 4 Cancer of the cervix 2 months after irradiation Cervix healed

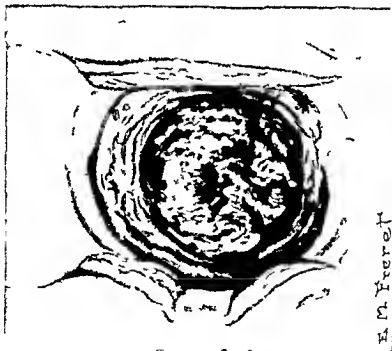


Fig 3 Cancer of the cervix 1 month after irradiation F stenose slough present in the cervix

Reaction of the Tissues to Radium in Treatment of Cancer of the Cervix—Lillian A. P. Farrar

cervix is a possible factor in the development of carcinoma of the cervix

Nearly all of the histories showed hard labors or instrumental deliveries and frequently the specific statement that the patient had been "badly torn" and "not repaired." In only 9 of the 288 cases in which children had been borne was it recorded that "lacerations" were repaired. In 6 cases the repair had been made after the first delivery and no repair was noted as having been made after the birth of the next child. *In no instance was it specifically stated that the 'repair' of laceration mentioned meant that the cervix itself was repaired.*

A search was next made to find the period of time elapsing between the last pregnancy and the occurrence of carcinoma in the cervix. In 206 of the histories it was recorded that carcinoma in the cervix occurred after the last pregnancy as follows

	Total cases	P r cent	Under 5 yrs	Under 10 yrs
3 mos	1	2.4		
5 mos	2			
9 mos	1			
11 mos	1			
12 mos to 5 yrs	18	8.7	11	1}
5 yrs to 10 yrs	19	9.2		20

In more than one tenth of the series of 300 cases cancer of the cervix had occurred less than 5 years after the last pregnancy, and in more than one fifth of the series cancer had occurred less than 10 years after the last pregnancy

Years	Cases	Per cent
10 to 20	86	41.7
20 to 30	50	24.4
30 to 35	15	7.2
35 to 40	11	5.3
40 to 45	2	.97
	99	87

The result of severe or repeated injuries in the cervical canal may be seen in the erosion or eversion of the lips of the cervix and in the cystic changes which take place in the glands themselves. Similar changes in the tissues elsewhere in the body are looked upon by pathologists as having an important bearing on the development of cancer. Dr Ewing says that "evidence points to the origin of

carcinoma from previously normal adult cells which pass through a series of changes induced by chronic irritation and terminating in carcinoma." Should we not expect to find cancer developing in the cervix when similar conditions are present there or produce cancer in other locations?

In a recent article by Dr William J Mayo entitled "The Influence of Ignorance and Neglect on the Incidence and Mortality of Cancer" Dr Mayo says "I have never observed a case of cancer in which there had not been some pre existing instability of the tissues and a long continued irritation. It would seem as if the long suffering tissues respond to the chronic insult of the injury by supplying for repair, cells less and less mature until finally through sheer inability to supply sound cells to heal the lesion the tissues reach a stage in which there is an uncontrolled production of unsound cells too immature to heal the breach of continuity or furnish surface protection to normally protected tissues."

In the recent meeting of the American Medical Association at Dallas, Texas a symposium was given in the Section of Obstetrics and Gynecology on "Diseases of the Cervix" and emphasis laid on the importance of healing erosions of the cervix, and the employment of treatment by cautery operation and various other methods. For the erosions produced by lacerations of childbirth it seems only logical to ask why not repair the lacerations and in view of the changes produced in the cervix after injury that necessitate treatment by cautery which must destroy a portion at least of the cervical tissue, or by amputation which in itself is a serious operation for a woman who hopes to have more children, why not repair the lacerations early? Much has been done and is being done medically in prenatal work to put the expectant mother in the best possible condition and so safeguard her for the labor, but are we giving sufficient attention surgically to the postnatal conditions and especially to the injuries present in the birth canal after the delivery? The teachings of Holmes and of Semmelweis revolutionized the practice of midwifery and accomplished for the world such economic progress that there is no work comparable to it except perhaps that of

Gorgas but their work ended with the birth of the child. There seems to be a pause between the termination of the duties of the obstetrician and the beginning of the responsibility of the gynecologist. To whom belongs the patient at this stage?

The practice of obstetrics is a surgical specialty and the obstetrician is or should be a skillful operator. The European *Frauen Klinik* combines two specialties as one and in no other way can the patient be adequately cared for than by an obstetrician who is also a gynecologist. Is it good surgical judgment then to leave unrepaired injuries in the cervix that may be a source of morbidity to the patient, an economic loss to society of no little importance if the injury means not only failure to conceive or carry to term future children but if such injury has any influence on the development of malignancy at some later period? Post natal care of a patient should include repair of injuries to the cervix either by immediate, intermediate or secondary operation depending upon the extent of the injury, the condition of the patient and whether the operation can be conducted with adequate assistance and aseptic technique. For the primipara delivered in a hospital where all the assistance desired may be obtained the repair of the lacerations made with the same aseptic precautions as the delivery and with surgical skill and judgment the result should be satisfactory. Because the operation needed is one of suturing only and the repair is done as a part of the delivery. If the surroundings are not favorable for this work an intermediate operation so long advocated by Dr. Barton Cooke Hirst may be preferable. For multiparae who have old scars in the cervix the injuries may better be repaired at a secondary operation. This to the patient means unfortunately another operation with additional expense and time in the hospital.

A recent survey of the advance of cancer in certain states where most careful registration has been conducted shows a progressive increase in the cancer death rate. The importance of healing infected or eroded cervixes is being impressed upon patients but why not teach them the far more important need of

repairing the cause of the lesion—the lacerations which occurred at childbirth and which lead inevitably to these conditions? A secondary operation performed before damage has been done to the cervical tissues need be only a simple trachelorrhaphy necessitating but a few days in the hospital.

In the historic paper of Dr. Thomas Addison Emmet "Lacerations of the Cervix Uteri as a Frequent and Unrecognized Cause of Disease" first reported before the County Medical Society of New York nearly 52 years ago Dr. Emmet emphasized the need of early repair of the cervix and in the discussion of this paper Dr. J. Marion Sims said "I now only wonder that this operation has not been worked out sooner. When the perineum is lacerated the necessity for its reconstruction is self evident and it is singular that the necessity for reconstructing the integrity of a lacerated cervix did not sooner force itself upon the surgeon. The discussion of the subject must of necessity be one sided. There can be no objection, no opposition to the operation. We must accept it as Dr. Emmet has given it to us. We can't modify the operation, we can't change it, we can't improve it—for it is perfect—perfect in the method and perfect in its results. We owe to Dr. Emmet a debt of gratitude for this valuable contribution to uterine surgery. Like all new operations it is likely to be abused but the time will soon arrive when it will assume its place in the foremost rank of useful improvements."

The Emmet trachelorrhaphy seems in the light of newer methods of treatment and technique not to be abused as Dr. Sims prophesied but to be forgotten. With the increasing percentage of cancer of the cervix is it not possible to lessen the menace of this terrible disease by turning back to the teachings of 50 years ago? Inspect the cervix of the recent mother and then employ a technique so simple that when it is performed soon after the injury has occurred it will restore the tissues to normal.

CONCLUSIONS

1. Cancer of the cervix when treated by radium shows a progressive course toward contraction of the cervix and inhibition of the cancer cells in well defined stages of (1)

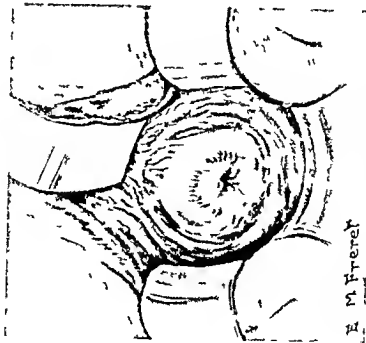


Fig. 5. Cancer of the cervix 3 months after irradiation. Cervix pale beginning to show contraction

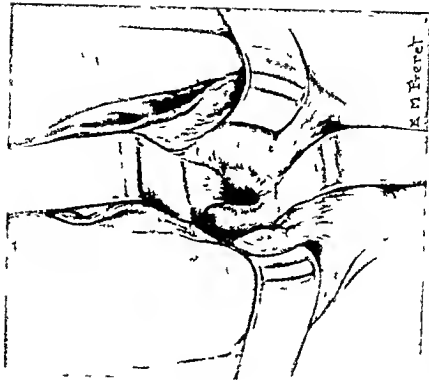


Fig. 6. Cancer of cervix 6 months after irradiation. The lips of cervix have entirely disappeared, vault of vagina and vaginal canal narrowed

Reaction of the Tissues to Radium in Treatment of Cancer of the Cervix — Lillian A. P. Farrar

hyperæmia, (2) slough, (3) healing, (4) contraction

2 When the cervix is markedly contracted and the internal os closed, pyometra or hæmatometra is not infrequent and is easily treated by dilatation of the internal os and irrigation of the uterine cavity

3 In 300 consecutive case histories of cancer of the cervix at the Woman's Hospital it was found that pregnancy (children or miscarriages) had occurred in 96 per cent of the cases. In the 288 cases in which children had been borne, 115 of the patients had had 5 or more than 5 pregnancies and 35 of these had had from 10 to 23 pregnancies. In 288 cases of cancer of the cervix, *11.1 per cent of the patients had had the last pregnancy less than 5 years before entering the hospital for cancer of the cervix*, and 20.3 per cent had had the last pregnancy less than 10 years before entering the hospital for the treatment of cancer of the cervix

4 A careful palpation and *visual* inspection of every cervix immediately after the confinement and an Emmet trachelorrhaphy performed for lacerations in the cervix would, we believe, lessen the danger of cancer development in the cervix later. Intermediate or secondary repair of the lacerations should be made when conditions do not warrant an immediate repair

BIBLIOGRAPHY

- 1 BAUMS H Die Behandlung frischer Zervixrisse München med Wchnschr 1925 lxxv 1975
- 2 BUNIS J L The immediate repair of the cervix after childbirth Cleveland M J 1918 xvii 149
- 3 COFFEY TRITIAN Cervical repair following confinement Am J Obst 1917 lxxvi No 2
- 4 Idem Intermediate cervical repair following confinement California State J M 1923 April
- 5 CLIVEN T S Cancer of the Uterus 1909 p 651 and 14
- 6 DAVIS F P The immediate repair of the cervix Operative Obstetrics 1912 p 492
- 7 ENGEL LUDWIG A The repair of birth lacerations of the cervix uteri immediate trachelorrhaphy Am J Obst & Gynec 1924 vii No 1
- 8 EMMET T A Lacerations of the cervix uteri Am J Obst 1874 vii
- 9 EWING JAMES Neoplastic Disease 1919 p 458
- 10 HIRST B C Fifteen years experience with the intermediate repair of the injuries of childbirth Am J Obst 1917 lxxv 752
- 11 HOFFMAN F L Discussion J Am M Ass 1923 lxxvi 1175
- 12 JOHANNSEN TH Behandlung blutender Zervixrisse nach Spontangeburt Zentralbl f Gynaek 1925 viix 1185
- 13 LITTMANN Handbuch der Frauen Heilkunde vol ii p 19
- 14 MASON W J The influence of ignorance and neglect on the incidence and mortality of cancer J Indiana M Ass 1914 xvi 331
- 15 POLAK J O The defects in our obstetric teaching J Am M Ass 1921 lxxvi 1809
- 16 REDER T Cervical lacerations their significance for the patient Am J Obst 1917 lxxvi No 5
- 17 REEL P J The danger of cervical erosion Am J Obst & Gynec 1925 x 94
- 18 SNIESCHESKI J W Cancer mortality J Am M Ass 1925 lxxxv 1175
- 19 SKEL A J Immediate repair of the cervix in childbirth Cleveland M J 1918 xvii 86
- 20 Idem Tr Am Ass Obst & Gynec 1918 xxx 196

ANEURISM OF THE RENAL ARTERY

BY WILLIAM P. CALLAHAN, M.D. AND FRANCES H. SCHILTZ, B.A., M.D. WICHITA, KANSAS

A CAREFUL search of the literature reveals only 39 cases of aneurism of the renal artery. In 1923 Conroy (2) was able to assemble 31 cases from the literature and to add 1 of his own observation. This number did not include 3 cases published by Newman (4) in 1915. Since 1923 Rowlands (7) has reported 1, Soderlund (9) 1 and Schramm (8) 2 new cases.

On the basis of Conroy's publication and the 7 additional cases we have assembled we will review a few important facts regarding this condition. Approximately only 1 per cent of all aneurisms affect the renal artery, one third occurring in the main artery and two thirds in its branches. The average age is 46 years. Of the 40 cases of aneurism recorded including the authors 18 are traumatic, 21 are spontaneous and 1 is unclassified. Thus 54 per cent are of spontaneous origin. Arterio-sclerosis, syphilis, embolism or some antecedent infection is most commonly the cause of the spontaneous type. Traumatic aneurisms are nearly always false although 3 were reported with no history of trauma. On the other hand spontaneous aneurisms are usually true but here again 2 cases followed trauma. Nineteen of the above cases are false, 19 are true and 2 are unclassified.

The most important sequelae are (1) rupture into the pelvis producing hematuria, (2) rupture into the peritoneal cavity with no consequent hematuria and (3) destruction of the kidney. In 18 cases the aneurism ruptured into the pelvis, 12 being false and 6 true. In only 2 was the rupture into the peritoneal cavity, both being false. Destruction of the kidney is quite characteristic of the false type; true aneurisms cause very little destruction of the renal substance in comparison. Key and Akerlund mentioned "small round celled infiltrations" and Soderlund "infarct formation" as secondary consequences.

According to Conroy the syndrome of aneurism of the renal artery is abdominal pain

closely followed by hematuria. In his collection hematuria occurred in 15 of 28 cases with reliable histories, in the 7 cases we have assembled and our own it was present 6 times, absent once and history was insufficient in 1. In the 35 cases with histories hematuria was present in 60 per cent. The tendency of the hemorrhage to cease and to recur at intervals of a few days to 1½ years is quite characteristic. Three cases were reported in which death occurred within 2 weeks due to exsanguination. Pain is not a very reliable symptom, as it is so often associated with trauma when organs other than the kidney may have been injured. In 2 of Newman's cases pain was associated with micturition and was probably due to blood clots in the ureter. Soderlund attributed the attacks of "cutting pain" in his case to a renal infarct. In our case the type of pain suggested pressure on the renal plexus.

The most valuable sign is a palpable tumor in the kidney region. This was present clinically in 16 of Conroy's 28 cases with reliable histories. Schramm reported one with tumor which also had pulsation and a bruit. In 17 out of 36 cases 47 per cent tumors were present clinically. Conroy reported pulsation in 2 and a bruit in 1 case.

Although no absolute division of the types can be made clinically yet it will be simpler to consider them in groups. The false aneurisms which are usually of traumatic origin are more often associated with pain, hematuria and a tumor than are the true aneurisms. According to Conroy these may be mistaken for (1) hydronephrosis, (2) renal neoplasm and (3) ruptured kidney. In hydronephrosis there is usually no history of antecedent trauma, hematuria is generally absent and the size of the tumor varies. In aneurism the pain is intermittent, the onset of weakness and anemia is sudden, and cachexia is absent as contrasted with a renal neoplasm. Nothing short of an exploratory operation will make it possible to differentiate between aneurism and



Fig 1 Roentgenogram of left kidney showing the shadow of the aneurism



Fig 2 Roentgenogram of left renal region showing shadow and catheter *in situ*

ruptured kidney Newman observed during cystoscopic examination in 2 cases, that "when pressure was made with the kidney between the hands, one behind and the other in front, blood was seen to flow from the ureter, and when the pressure was withdrawn the flow ceased"

The true aneurisms may persist over long periods of time without causing symptoms, although hematuria, pain, and tumor may occur. In 5 cases, Barnard's, Conroy's, Key and Akerlund's, Soderlund's and our own, the aneurism was calcareous. The roentgenogram showed positive findings in the last three named. The conditions most likely to be confused with these calcareous aneurisms are (1) retroperitoneal glands, (2) renal calculus, and (3) cholelithiasis. Newman writes "symptomless hematuria in renal tuberculosis is a more common occurrence than is generally suspected." In all cases of symptomless hematuria a cystoscopic, a roentgenological, and a bacteriological examination should be made, as well as the chemical and physical examination of the urine.

The shadows obtained by roentgenological examination of our patient were unique and very similar to those obtained by Key and Akerlund, and Soderlund. The former described "a round shadow of a calculus, the size of a pea with shell shaped deposit on surface, calculus of urates with shell of car-

bonated phosphates." Soderlund recognized the similarity between the shadow obtained in his case and the one just described. His pre-operative diagnosis of aneurism of the renal artery was correct.

Conroy states that all cases which give rise to symptoms have a 100 per cent mortality, unless an operation is performed. Without operation, death may occur from 2 days to 5 years after onset. In the small true aneurisms the prognosis is much less serious, and in those which have become calcified, rupture is

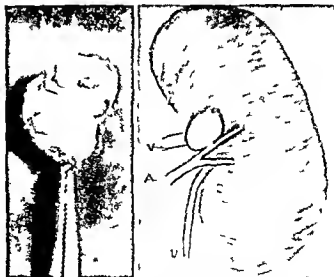


Fig 3 (left) Photograph of aneurismal sac.

Fig 4 Schematic diagram showing site of the aneurism
V vein a artery u ureter



Figs. 5 and 6 Photomicrographs showing section through aneurysmal sac and artery wall. Note abrupt cessation of elastic layer. Low and high power.

improbable. Soderlund questions the advisability of removing calcareous aneurisms especially if a nephrectomy must be resorted to unless the pain is severe.

In the 12 operations performed up to the present 10 were cured and 2 died. Nephrectomies were done in 10 cases. In Orth's case he was able to turn out the clots and successfully suture the tear and in the authors' case it was also possible to excise the sac and preserve the artery. Orth reported good function 1 year later and in our case the function is good up to the present 6 months following operation.

In spite of the convincing clinical picture presented by Richardson in a case recently published by him this is not included in the tabulation (Table I).

Our own observation was as follows:

Mrs. T., aged 44, presented herself complaining of abdominal pain and backache chiefly on the left. This trouble began about 6 years ago but became progressively worse the last 2 years. Eighteen months ago the patient had an attack of sharp, intermittent pain lasting 2 days so severe she could not sleep, relieved only after a hypodermic had been given. This sharp lancinating pain started in

the epigastrium and then radiated to the hypogastrium. During this attack she remained in bed about a day. Her menses commenced the same day and as soon as the flow was well established the severe pain ceased, only a sense of soreness remaining. During the past year there has been some postural relief when she leaned to the left. The patient has not been able to perform her household duties for the last 3 months but had no further acute attacks until 4 days ago, again simultaneous with her menstrual period. This attack was similar to the first but more severe, four hypodermics being given by her local doctor before relief was obtained. After admission to the hospital there was no more acute pain but some abdominal soreness and the lumbar ache persisted. There was some nausea but no vomiting. There was no history of trauma. Nocturia was present once or twice each night but there was no day frequency. The patient gained in weight and her appetite was excellent.

The physical examination was of a well developed and nourished individual. There was some arterio-sclerosis of the peripheral vessels. The systolic blood pressure was 142, the diastolic 80. The heart was slightly enlarged to the left but was otherwise normal. The abdomen was full and rounded but not distended; there was no rigidity but some tenderness in the left lumbar region. The kidneys were not palpable but tenderness was elicited over the left. A pelvic examination revealed no abnormalities. The leucocyte count varied from 11,100 to 15,750. The urinalysis, which was done repeatedly, showed

TABLE I—CASES REVIEWED AND REPORTED SINCE 1915

Reported by	Date reported	Traumatic	Spontaneous	Unclassified	False	True	Unclassified	Hematuria	Pain	Tumor	Operation	Prognosis		Remarks
												With Operation	Without Operation	
1-32 Conroy	1923	77	75		28 (15 traumatic 3 no trauma)	23 (11 spontaneous 2 traumatic)	1	+ in 15 of the 28 cases	In 14 of 19 cases it occurred as associated with trauma. Unreliable symptom	+ in 16 of the 28 cases	5 nephrectomies 1 excision of aneurism kidney preserved	3 cured 2 died	100% mortality in cases which gave rise to symptoms Good in cases which do not give rise to symptoms	28 cases with reliable histories
33 Newman	1925		1			1		+	+ during micturition because of clots	—	Nephrectomy	Cured		
34 Newman	1925		1			1		+	+ during micturition because of clots	—	Nephrectomy	Cured		
35 Newman	1925			1			1	+	—	—			Autopsy	Insufficient history
36 Rowland	1924		1			1		+	—	—	Nephrectomy	Cured		
37 Soderlund	1925		1			1		Very slight	+	—	Nephrectomy	Cured		
38 Schramm	1925	1			1			+	+	+ also pulsation and bruit	Nephrectomy	Cured		
39 Schramm	1925		1			1		?	?	—			Autopsy	Insufficient history

no blood cells or albumin, chlorides were 0.18 per cent, and urea was 1.84 per cent. A cystoscopic examination showed a mild trigonitis, due to a moderate degree of cystocele; the ureters were patent throughout, and there was a free flow from each kidney, though more abundant from the right side. A phenolsulphonephthalein test gave a total of 77 per cent. The blood urea was 46.9 milligrams per 100 cubic centimeters.

A roentgenogram showed a shadow approximately the size of a hazel nut in the upper region of the left kidney; the periphery was very dense, while the interior was quite diffuse. The right kidney appeared normal. A pyelogram showed the pelvis to be of normal position, size and shape. The oblong blunt shadow on the left lay anterior to the plane of pelvic projection and encroached upon it. Although the shadow was not typical of stone, yet it was suggestive and a tentative diagnosis of renal calculus was made.

Operation. An oblique lumbar incision was made and the kidney exposed by an extraperitoneal approach. A hard, round mass, the size of a walnut, was found intimately associated with the renal pelvis and loosely connected with the renal artery just distal to its bifurcation. There was no pulsation and even at this time it was not possible to rule out calculus. In an effort to dissect the mass a small incision was made and immediately a blood spurt from the sac revealed its true nature. Fortunately,

the aneurism was of the sacculated variety and hemorrhage was controlled by clamping the sac at its communication with the artery. It was also ligated at this point and the sac excised. The perforation in the artery was closed without sacrificing the artery or any part of the kidney. The renal arteries were arteriosclerotic (Figs 3 and 4).

Pathological report. Specimen consists of a cystic tumor, with hard calcareous wall. It is almost spherical, its diameters being 2.6 and 2.3 centimeters. On one pole there is a small opening 2 millimeters in diameter with the impression of a hamostat, the site of dissection from the artery. The interior is shining, yellowish white and smooth with the exception of 2 small reddish brown thrombi. The calcification of the wall is due to a calcific lamina of three eighths millimeter thickness forming a continuous layer in the wall and being interrupted only at the entrance of the artery into the sac (Figs 5 and 6).

Microscopical examination was made by Dr. Helling. Section through the entrance of the sac shows part of the wall of the renal artery (upper half of Figs 5 and 6). The intima is thickened and the media is infiltrated by fat partially replacing the elastic and muscle tissue. In the lower half of the figures the media is shown interrupted against the newly formed wall of the sac. Here the wall consists mostly of broad hyaline connective tissue. The intima is flattened and the adventitia is incorporated

with the surrounding structures. There is no evidence of syphilitic change.

Pathological diagnosis: arteriosclerotic saccular aneurism of the renal artery.

Twelve days following the operation the blood urea had come down to 34 milligrams per 100 cubic centimeters as compared with 46.9 milligrams 2 days preceding operation. The patient made an uneventful recovery and was dismissed from the hospital 2 weeks after operation. During the 6 months since her operation there has been no recurrence of the abdominal pain or the lumbar ache.

CONCLUSIONS

1. This case brings the total number of reported cases of aneurism of the renal artery up to 40. It may be classed with the spontaneous and true aneurisms.

2. Abdominal pain was present but hematuria was constantly absent. There was no palpable tumor and no pulsation. None of the classical symptoms of aneurism was present.

3. During the acute attacks which the patient had relief was obtained after the menstrual flow was well established. We could not explain this fact satisfactorily.

4. The roentgenogram provided the principal aid in diagnosis. The shadow was

unique. The periphery was dense and outstanding while the center was diffuse. This is the third case of aneurism of the renal artery in which positive roentgenological findings have been noted.

5. In 10 of the 12 operative cases previously reported nephrectomies were performed. Fortunately the aneurism was so situated in this case that the kidney could be preserved. This is the second case on record in which the kidney has been preserved.

6. Operative mortality is 17 per cent, while in those cases which give rise to symptoms and are not treated surgically, it is 100 per cent.

BIBLIOGRAPHY

1. BARNARD H. I. *Tr. Path. Soc. Lond.* 1900-01 liii 254.
2. CONROY M. J. *Ann. Surg.* 1925 lxxviii 628-640.
3. KEY L. and AKERLUND A. *Fortschr. a. d. Geb. d. Roentgenstrahlen* 191 -19 xxv 531.
4. NEWMAN D. *Brit. J. Surg.* 1915 ii 360.
5. ORTH O. *Deutsche Ztschr. f. Chir.* 1919 cli 272.
6. RICHARDSON C. B. *Brit. M. J.* 1925 i 70-71.
7. FOWLANDS R. I. *Brit. M. J.* 1924 ii 939-940.
8. SCHRAMM H. *Ann. Surg.* 1925 lxxvi 105-107.
9. AKERLUND C. *Acta Chir. Scandinav.* 1925 lvi 649-663.

DILATATION OF THE BILE DUCTS (HYDROHEPATOSIS)¹

By VIRGIL S. COUNSELLER, M.D.

AND

ARCHIBALD H. McINDOE, M.B., CH.B. (N.Z.), ROCHESTER, MINNESOTA

Fellow in Surgery, The Mayo Foundation

THE effect of obstructive lesions of the bile ducts on the parenchyma of the liver and the biliary tree has been known for many years. Frerichs, in 1858, made the first comprehensive study of the subject and his conclusions have in the main been confirmed by subsequent investigators. Wyss and Leyden tied the common bile ducts in cats and dogs and described the resulting dilatation of the biliary passages with the associated fatty changes in the hepatic cells. Mayer, in 1872 repeated this work and obtained the same results, but also found atrophy of the hepatic cells together with lymphocytic infiltration of the parenchyma. In the same type of experiment, Legg in 1873, noted among the earliest clinical phenomena, emaciation and jaundice. Dilatation of the ducts extending to the smallest radicles was seen together with very marked increase in the connective tissue surrounding them. From the absence of glycogen in the cells he concluded that the glycogenic function of the liver was soon lost. This work was further extended by Harley and Barratt who ligated the left hepatic bile duct in a series of cats and found that very little gross change occurred in less than 4 months. After 6 months however the capsule was wrinkled and the lobules were more prominent on the left than on the right. After 12 months other changes were plainly visible. Marked atrophy of the left lobe had taken place with considerable superficial scarring. The bile ducts were found dilated throughout their course, tortuous, varicose, and filled with viscid yellowish fluid. Microscopically atrophy of the hepatic cells had occurred with marked formation of fibrous tissue at the terminal bile ducts and proliferation of the finest branches in this situation. In short, obstructive biliary cirrhosis as defined by MacCallum, had occurred. More recently, Rous and Larimore have extended these experimental observations (31).

In regard to the liver of man Ford and Weber were among the earliest to draw attention to the changes occurring in the bile ducts and parenchyma from obstruction due to stones confirming in general the results obtained by experiments on animals.

In this study we wish to depict the extent of the damage in various types of obstruction by a method which lends itself particularly well to the purpose namely, the celloidin-injection and corrosion method. It was one much used by the earlier anatomists in the demonstration of normal structures and occasionally for pathological purposes although not so much as its usefulness warrants. More recently it has been applied to the kidney by Golubew, Brodel, Hinman, Morison and Brown to the lungs by Marquis and to the submaxillary gland by Flint and Marshall (mostly for study of the normal). By this means the specimen is easily studied, and forms a valuable addition to any pathological museum, especially if exhibited along with the gross specimens preserved by the usual methods.

The material was all obtained from unembalmed subjects at necropsy. For comparison normal livers were first injected and casts made of the normal biliary tree. A selection of cases of various lesions of the biliary tract was then obtained and similar preparations made. We have thus four series of preparations: one showing the normal, and three the effect of various grades of cholecystitis and cholelithiasis, of cholecystectomy, and of benign and malignant stricture.

METHOD

Our method has been that of Hinman, Morison and Brown with certain important modifications. As soon after death as possible the liver is dissected from the abdomen complete with the diaphragm, and as much of the superior and inferior vena cava as possible

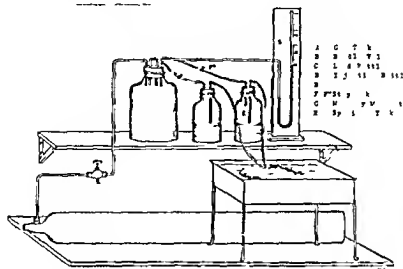


Fig. 1. Injection apparatus.

The gastrohepatic omentum containing the portal vein, hepatic artery and bile duct is severed close to the duodenum. Great care is taken not to injure the capsule of the liver at any situation or leakage will occur. Cannulas with as wide a lumen as possible are then placed in the portal vein and common duct and a stab hole made in the fundus of the gall bladder.

The portal vein is connected by rubber tubing to an ordinary cold water faucet and the liver immersed in a tank of cold water. The tap is gradually turned on until there is a free flow from the hepatic veins and the liver itself is tense almost to the bursting point. We have not found it necessary to use an isotonic solution in washing out before injecting either the bile ducts or blood vessels, ice cold water being entirely satisfactory. Washing is carried on for varying periods up to 12 hours. The difficulty is to remove the bile from the blindly ending system of ducts and satisfactory injections can be obtained only when this has been successfully accomplished. The high pressure within the capsule is used first to squeeze out as much bile as possible just as one would squeeze a sponge and second to cause the water to filter through into the ducts and so wash out the viscid contents. Puncturing the gall bladder prevents overdistention of that organ. When washing is complete the liver is removed and wrapped

in towels, weights up to 15 pounds are then laid on it. The towels are repeatedly changed so that in a few hours the accumulated fluid within the organ is removed and it assumes a shrunken appearance and clayey consistency. This method was first advocated by Beale and with it we have been able to produce much improved specimens.

The cystic duct is next clamped off and the liver connected to the injection apparatus (Fig. 1). This consists of gas cylinder A connected through a needle valve B to a lead bottle C. To this any number of injection bottles D and E containing injection fluid can be connected according to the number of vessels to be injected. A manometer G records the pressure. The injection fluid consists of a solution of celluloid in acetone prepared according to the method of Hinman, Morison and Brown. Although we keep the A and B solutions stocked as recommended by them we do not use any fixed dilutions for injecting but vary them according to the vessel to be injected and the type of injection required. Experience will determine the most suitable consistency. For the bile ducts we find that a preliminary injection of such watery consistency that it drips easily from a glass rod followed by one like thick cream gives very satisfactory results. We have discarded the dyes commonly used as coloring agents, and have found artists' oil paints

of any standard quality, superior, particularly in the smaller branches where an opaque bright permanent color is desirable

Before the tube from the injection bottle is connected to the cannula, the former is filled with fluid to exclude as much air as possible. All connections are then made tight and the pressure rapidly raised to 360 millimeters of mercury and maintained at that level for 6 hours. At the end of this time the thick solution is substituted for the thin one and injection proceeded with for another period of from 24 to 36 hours at a pressure of 200 millimeters. At the same time a slow stream of cold water is run through the portal vein in order to wash out the accumulated acetone and so facilitate the hardening of the smaller branches. The lengthy injection period serves the purpose of completely filling all the branches, so producing a solid cast, and at the same time preventing the shrinkage which is likely to take place if hardening occurs after the pressure is released. Sections for microscopic examination can be safely taken at any time after the smaller branches are set.

By palpating the common duct, one can judge how the hardening process is progressing as soon as this is considered to be complete the liver is removed from the tank and immersed in concentrated hydrochloride acid for from 4 to 5 days. The parenchyma is rapidly corroded, any material adhering to the branches of the bile duct is washed away with a fine stream of cold water. A perfect specimen, including the parietal sacculi and vasa aberrantia, should thus be produced. The specimen is best mounted on a sheet of glass perforated with small holes, through which the branches can be secured with fine thread. It is then sealed in jars containing a sprinkling of camphor on the bottom covered by a sheet of wet blotting paper, according to the method of Lundquist. By this means the celloidin is prevented from drying and becoming brittle.

RESULTS

In all twenty six livers of the four types previously mentioned were examined by this method, the change in the caliber of the ducts

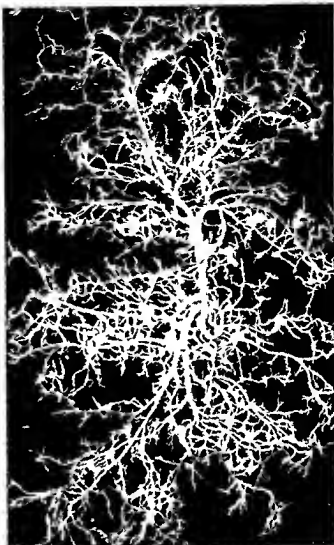


Fig. 2 (Case 2) Normal biliary tree showing slender branches vasa aberrantia and parietal sacculi. (Examine with hand lens)

being measured as accurately as possible by fine external calipers and screw gauge. Although shrinkage has been eliminated as much as possible by hardening under long continued pressure, there is no doubt that a certain amount occurred, but it was so slight as to be practically negligible. Since this factor was practically constant throughout, the method and conditions being identical for all cases, the measurements afford a good index of the changes in internal diameter of the biliary passages. In the tables under each type, a brief outline of the clinical history and principal lesions is given together with the diameter of the common hepatic ducts, right and left hepatic ducts, and branches of the first, second, third, fourth and fifth orders.



Fig. 3 (Case 1.) Cholelithiasis and functionless gall bladder generalized mild dilatation of ducts

A thorough study of ten biliary trees from normal livers was first carried out in order to establish a criterion for the comparison of abnormal types. Figure 2 (Case 2) represents a cast of this description. The common and hepatic ducts form a comparatively slender trunk varying in diameter from 2.1 to 4.8 millimeters. Five millimeters was therefore taken as the greatest normal diameter in this situation. Within the hilus of the liver the common hepatic divides into right and left branches and these in turn form five or six smaller branches. By a descending order of divisions diminishing in size but increasing in number the remainder of the tree is built up until at the fifth order the ducts have become mere filaments. The right hepatic duct varies in size from 1.6 to 3.4 millimeters the left from 1.4 to 3.6 millimeters. Sometimes the left duct is wider than the right although the reverse occurs more frequently. In the

ucceeding branches those of the first order vary from 1.1 to 2.2 millimeters, those of the second from 0.8 to 1.5 millimeters, those of the third from 0.3 to 0.8 millimeters, those of the fourth from 0.1 to 0.3, and those of the fifth from 0.05 to 0.1 millimeters (Table 1).

As far as the ducts themselves were concerned and exclusive of the vasa aberrantia no anastomosis between the two sides was found as far out as the fifth order of branchings, a condition which we have demonstrated in the portal vein as well. That is to say outside the canalicular circulation of bile and the capillary and venular circulations of the portal blood there is no gross anastomosis between the right and left branches of bile ducts or portal vein. In the case of the hepatic artery a slightly more marked arteriolar anastomosis from side to side is usually established (22).

As Mall has shown the finest bile ducts are given off from the fifth order of branchings onward. In some of our injections as many as six orders could be counted although many terminated at the fourth division. It can therefore be assumed that the injection mass has penetrated to at least within one branch of the hepatic columns or just proximal to those finer ducts which undergo such marked proliferation in cases of obstructive biliary cirrhosis.

Between the right and left hepatic ducts, in the transverse fissure in the left coronary ligament and in the membranous bridge which unites the spigelian and right lobes behind the inferior vena cava are a number of anastomosing tubules arising from opposite sides of the ducts and appearing as tortuous, curled branching processes ending frequently in cap-like dilatations. To these structures Weber gave the name of vasa aberrantia considering them to be the remnants of previously functioning ducts. In the transverse fissure they form a slight anastomosis between the right and left hepatic ducts. Besides these structures are the two rows of parietal sacculi (2) or mucous glands (34). In regular fashion they sprout from opposite sides of the lumen and within the wall form an anastomosing cluster of small vessels dilated at their distal ends and frequently connected with the vasa aberrantia. It is rather a curious fact that

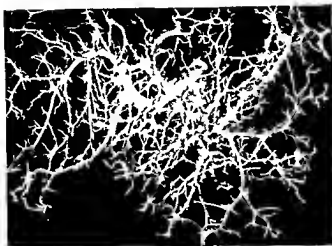


Fig 4 (Case 21) Cholelithiasis and choledocholithiasis generalized dilatation

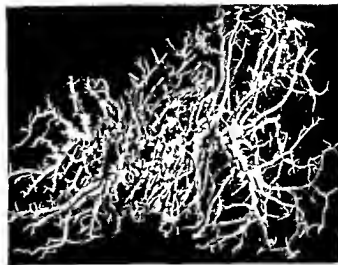


Fig 5 (Case 22) Incomplete benign stricture beginning sacculcul of ducts with mild clubbing

practically all the branches of the biliary tree, together with the vasa aberrantia, arise from opposite sides of the duct along the lines of a parietal sacculi. In general, therefore, the duct wall shows two smooth surfaces separated by two rows of afferent ducts. The parietal sacculi can be traced throughout the course of the duct as far out as those measuring 0.1 millimeter in diameter. The effect of pathological processes on these structures will not be considered at this time.

CHOLELITHIASIS

Eight cases were examined in which careful clinical investigation had failed to show any

evidence of previous biliary disease, and in which the presence of stones in the gall bladder and their absence in the common duct was revealed only at necropsy. It seemed safe, therefore, to exclude the effect of stones in the common duct in considering changes produced in that situation. In seven cases, evident dilatation of the ducts had taken place, mild in degree but present throughout the whole system. Thus the common hepatic duct varied in diameter from 6.5 to 11.5 millimeters, the right hepatic from 3 to 8 millimeters, the left hepatic from 3.5 to 7 millimeters, the first order from 2.5 to 5 millimeters, the second from 1.7 to 3 millimeters, the third from 0.7 to

TABLE I—DIMENSIONS OF NORMAL BILIARY TREES

Case	Sex	Age	Diagnosis	History of biliary disease	Condition of gall bladder	Obstruction of common duct	Diameter of ducts—mm							
							Hepatic			Successive branches in descending order				
							Common	Left	Right	First	Second	Third	Fourth	Fifth
1	F	25	Placenta prævia	None	Normal	None	4	3.5	3	2.1	1.5	0.7	0.1	0.05
2	M	47	Tumor of brain	None	Normal	None	3	2.7	2.2	1.5	0.9	0.4	0.2	0.05
3	M	57	Carcinoma of stomach	None	Normal	None	4	3.1	4	2	1.1	0.8	0.2	0.1
4	M	47	Carcinoma of nose	None	Normal	None	4.1	2.8	3.1	2.2	1.4	0.6	0.3	0.08
5	F	67	Tumor of brain	None	Normal	None	3.8	2.4	2.6	2.2	1	0.8	0.2	0.1
6	F	21	Dermatomyositis	None	Normal	None	3.9	2.6	2.8	1.4	1.1	0.5	0.1	0.1
7	F	54	Coronary thrombosis	None	Normal	None	3.3	3	3.1	2	1.2	0.6	0.2	0.07
8	F	31	Pyelonephritis	None	Normal	None	2.1	1.4	1.6	2.1	0.8	0.3	0.1	0.05
9	M	43	Tumor of cord	None	Normal	None	4.8	3.6	3.2	2	1	0.5	0.2	0.1
10	M	50	Syphilis of central nervous system	None	Normal	None	4.6	3	3.4	2	1	0.5	0.1	0.05

TABLE II—DIMENSIONS OF BILIARY TREES IN CASES OF CHOLELITHIASIS AND FOLLOWING CHOLECYSTECTOMY

Case	Age	Diagnosis	History of biliary disease	Condition of gall bladder	Operated on and extent	Diameter of Duct—mm						
						Hepatic		Scallop branches descending				
						Common	Left	Right	First	Second	Third	Fourth
11	53	Chronic cholecystitis	Indigestion 5 years	Three small partial function	None	4	3	3.5	2	1.5	0.5	1
12	52	Myocardial degeneration	None obtained	Multiple stones functionless (?)	None	6.5	3.5	3	4	2.5	1	0.4
13	169	Chronic hemorrhage	None obtained	On large at partial function (?)	None	6.7	6	4.9	3.8	1.7	7	2.0
14	54	Calcium of ovaries	None obtained	Multiple stones functionless	None	7.5	3.8	1.2	3.4	3.1	1	0.5
15	56	Myocardial degeneration	None obtained	Multiple stones functionless	None	8	5.1	3	3	2.1	1	0.4
16	54	Abscess of lung	None obtained	Multiple stones functionless	None	10	4	3	3.5	2	1	0.4
17	55	Retroperitoneal lipomatosis	None obtained	Multiple stones functionless	None	10	7	8	5	5	3.5	3
18	56	Hypothyroidism	None	Multiple stones functionless	None	11.5	6	7	4	3	3	0.5
19	54	Cholecystitis cholecystectomy	Acute vomiting recurrent right upper quadrant pain 5 years	Gall bladder excised 9 days before cholecystectomy	None	3.1	3.8	4	1	1.5	0.7	1
20	54	Cholecystitis cholecystectomy	Used distressing right upper quadrant pain	Gall bladder excised 8 days before cholecystectomy	None	7.1	5.3	3.4	3.0	2.1	1.1	0.7
	56	Cholelithiasis cholecystectomy	Twelve years undisturbed	Gall bladder excised 8 days before cholecystectomy	Stones	9	8	7.5	4.8	3.5	4	0.6

1.5 millimeters the fourth from 0.2 to 0.5 millimeters and the fifth from 0.05 to 0.2 millimeters (Table II). Comparing these with the figures obtained from the normal specimens it will be seen that the increase is fairly uniform throughout although greatest in the extra hepatic ducts. The diminution in size is a gradual and insensible process not confined to any one set of branches. Case 11 in which no dilatation of the ducts occurred showed an absolutely normal biliary tree. An examination of the gall bladders in this series brings to light some interesting facts. The gall bladder in Case 11 contained three small stones but to all appearances was normal showing no inflammatory thickening adhesions, or dilatation. In other words the organ must have preserved at least some measure of function. In Cases 12 and 13 the condition was similar although evidences of chronic cholecystitis were more obvious here. In Cases 14 to 18 the gall bladder was filled

with stones and showed extensive thickening and fibrosis of the wall while in Cases 17 and 18 the gall bladders were reduced to fibrous sacs and were certainly functionless. Case 17 (Fig 3) is typical of the group. The outstanding point is that the amount of dilatation of the ducts runs parallel and is directly proportional to the amount of pathological change in the gall bladder wall and to its loss of function. It is of course not to be concluded that such loss of function is the sole factor in producing the dilatation.

CHOLECYSTECTOMY

Cases in which cholecystectomy has been performed are unsatisfactory and we lay little stress on them from the point of view of the effect of the entire absence of the gall bladder. Death occurred 8, 9, and 10 days following cholecystectomy which was performed because the gall bladder was entirely functionless. In none, therefore, can any change be attributed

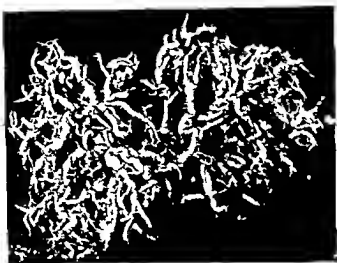


Fig 6 (Case 23) Complete malignant stricture of 6 weeks duration marked sacculation and clubbing of ducts

to the operative loss of the gall bladder. In all these cases dilatation of the ducts was similar to that observed in the last series but was most marked in Case 21 (Fig 4) in which stones were found in the common duct. In Case 19 dilatation was very slight and attained only 5.1 millimeters in the common hepatic duct. This is explained by the fact that at operation an internal fistula was discovered between the gall bladder and the transverse colon which provided for drainage of the biliary system.

STRICTURE

From Table III it will be noted that one stricture was benign and four were malignant, the latter causing far greater dilation than the former. The preponderance of the latter was due to the technical difficulties encountered in introducing a cannula into ducts, frequently a mass of scar tissue at the hilus or disorganized by operative intervention. In four cases marked chronic cholangitis had been established, while in one the process was acute, and multiple abscesses had formed.

The variation in diameter in the hepatic ducts lay between 10 and 30 millimeters, the right and left hepatic ducts being from 7.5 to 16 millimeters and from 8 to 20 millimeters respectively. The extent to which the process had been carried was indicated by the dilatation of the succeeding branches, the diameter varied from 4.8 to 13 millimeters for the first



Fig 7 (Case 24) Complete malignant stricture of 8 weeks duration extreme hydrohepatosis

order, from 3.5 to 8 millimeters for the second, from 1.4 to 6 millimeters for the third, from 0.2 to 1 millimeter for the fourth, and from 0.1 to 0.2 millimeter for the fifth. It will be noted that the longer and more complete the obstruction, the greater the dilatation and the further out it extends. Between the third and fourth branches, however, a rapid transition takes place so that the fifth branch appears as a terminal filament attached to the preceding stubby dilated duct.

Of the cases illustrated, Figure 5 (Case 22) shows the result of a benign fibrous partial stricture following cholecystectomy one year previously. It is to be noted that a much more severe grade of dilatation exists here than in either of the two preceding groups. There is a more abrupt change from the finest terminal ducts to the widely dilated channels of the main trunks, which show beginning saccula-

TABLE III—DIMENSIONS OF BILIARY TRITS IN CASES OF PARTIAL AND COMPLETE STRICTURE OF THE COMMON DUCT

C	Age	Diagnosis	History (biliary case)	Clinical findings	Obstruction of main duct	Diameter of ducts—mm							
						In patient			Sec. duct		In hepatic gland		
						Common	Left	Right	First	Second	Third	Fourth	Fifth
146		Biliary stricture of common duct	Cholestasis, myxoid degeneration, undecidability	Common bile dilated 1 year before multiple stones	Partial	10	7.5	8	5.5	3.7	6	0.75	
3	168	Calculation of bile ducts	Intermittent jaundice 6 months, attacks of fever, chills, rigors	Common bile dilated 6 days before cholecystectomy multiple stones	Complete for 6 weeks	14	0.5	13	7.5	6	4		
4	176	Calculation of pancreas	Fever, jaundice 8 weeks	Dilated	Complete for 3 weeks	18	12	13	0	6	3	0.5	1
5	177	Calculation of pancreas	Fever, jaundice 7 weeks	Dilated	Complete for 7 weeks	22	5	13	5.13	11	5	6	7
6	185	Calculation of pancreas	Intermittent jaundice 10 weeks, attacks of fever, rigors	Dilated	Complete for 10 weeks	3		6	13	8	6		1

tion of their walls. Figures 6 and 7 (Cases 23 and 24 respectively) represent the biliary trees in two cases of complete malignant stricture the first of six weeks and the second of eight weeks duration. In both sclerolization and varicosity of the ducts are extreme with well marked clubbing and stubbiness of the branches of the third and fourth orders giving place to the small terminal fifth branches. It is also obvious that as the walls become thin and stretched they become smooth and lose their parietal sacculi. Nearer the hilus of the liver the main trunks lie close together entirely dwarfing the portal vein and indeed as shown by simultaneous injection of ducts and vein in Case 25 causing stenosis and atrophy of many of its smaller branches with parenchymal atrophy of the areas supplied.

Figures 8 and 9 (Case 26) show superior and inferior views of a case of complete malignant stricture of the common duct of 10 weeks duration. Death was caused by acute cholangitis with multiple abscesses these being represented by the many small nodules attached to the ducts. The condition is comparable only to hydronephrosis and in its effect on the parenchyma of the liver is entirely similar. A comparison between Figures 2 and 10 is striking the average diameter of the com-

mon hepatic duct in the latter case being 30 millimeters and of the branches of the third order 6 millimeters.

DISCUSSION

Until quite recently dilatation of the bile ducts was considered to be one of the secondary affections of the liver. That it can assume an importance of the first magnitude is nevertheless certain. Weber was perhaps the first to emphasize the relationship existing between this condition and hydronephrosis and to point out the striking similarity in the associated lesions. On the same basis McMaster Brown and Rous to whom much of our knowledge of the experimental pathology of the liver is due, have proposed the term hydrohepatosis as descriptive of the change. In both conditions and indeed in conditions of obstruction of the ducts of all secreting glands, secretory stasis, dilatation of ducts, vascular disturbance from collateral pressure, sclerosis, and parenchymatous atrophy are the rule. The process is more marked in the case of the kidney because the secretory pressure is so much higher. Moreover, the slighter degrees of hydronephrosis are more apparent not only on account of the extraparenchymatous situation of the pelvis but by reason of the greater

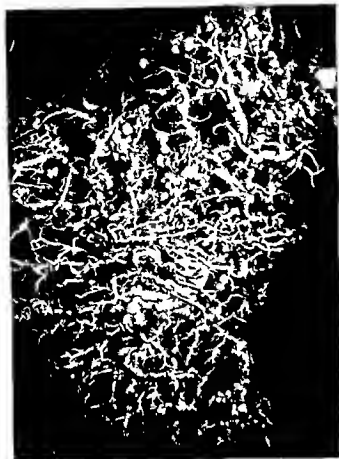


Fig 8 (Case 26) Superior surface showing complete structure of 10 weeks duration with acute cholangitis and abscess formation



Fig 9 (Case 6) Inferior surface showing tremendous dilatation of ducts with multiple abscesses

ratio of duct to secreting tissue. Nevertheless despite the fact that hydrohepatosis rarely becomes obvious from the exterior, unless it be in the extrahepatic ducts or around the edge of the left lobe the upset in internal economy is often no less profound.

From a physiological standpoint, McMaster, Broun, and Rous have further classified the condition as concealed or manifest, depending on the concentrating activity of the gall bladder. Provided the gall bladder is functioning, the contents of the duct above the obstruction will be dark and viscid, and the condition will be of the concealed type. If the gall bladder fails to act, or its powers of concentration are lost, then the ducts will contain "white bile" from resorption of pigment and secretion of mucus from their walls. The condition is then spoken of as "manifest." Kusch gave to this the name of hydrops of the biliary system. While it is true that the absence of the activity of the gall bladder is the predominating factor

in the production of a so called manifest hydrohepatosis there is no doubt that other things must be considered. For instance, the degree and duration of the obstruction, together with the presence or absence of a chronic cholangitis, will profoundly modify the condition. It seems to us, therefore, that on morphological grounds the term hydrohepatosis as an inclusive one is eminently suitable but that the division into two types is hardly necessary and serves only to confuse the issue. The important point is the obstruction and resultant dilatation by retained secretion rather than its physiological modification by extraneous influences. The two conditions are essentially identical.

A brief review of the various grades and types of hydrohepatosis is desirable here. In the cholelithiasis group, dilatation was mild in 7 cases and absent in one. Little except this slight generalized increase in diameter served to distinguish the ducts from the normal, although the change was, if anything, rather

more marked in the extrahepatic passages. The diminution in diameter was a gradual process not confined to any one particular order of branching. In Case 11 no dilatation occurred and as we have stated the gall bladder was apparently in very good condition even though it contained three small stones. The amount of hydrohepatosis in the other 7 cases was directly proportional to the amount of damage to the wall of the gall bladder being greatest when the organ had been reduced to a fibrous sac. When cholecystectomy had been performed hydrohepatosis also occurred but was least marked where a fistula had been established between the gall bladder and the transverse colon. It seems that in this case the drainage either prevented dilatation or caused a return of previously dilated ducts to normal by relief of intraductal pressure.

As is well known the sphincter of Oddi is the controlling mechanism of the flow of bile into the duodenum. The normal intraductal pressure has been variously estimated from 60 to 70 millimeters of bile with the normal tonus of the sphincter at from 60 to 300 millimeters (1, 5, 11, 13, 15, 32). Judd and Mann have shown that following cholecystectomy the extrahepatic ducts dilate but that dilatation is prevented by section of the sphincter. Kost finds that dilatation fails when the tonus of the sphincter is low. Bollman, Mann and Depage have shown that cholecystitis produced experimentally by a specific organism abolishes the concentrating activity of the gall bladder while Potter and Mann have demonstrated that cholecystectomy following such an infection causes a marked rise of pressure in the common duct. These results have been confirmed by Snell, Greene and Rowntree from the functional side. It seems therefore that the absence of the concentrating and consequently 'safety valve' action of the gall bladder either by disease or removal produces a generalized hydrohepatosis due to the rise in intraductal pressure against the tonic sphincter. Judd has found that at operation this result is constantly seen in the common duct. Our observations tend to show that the process affects the whole biliary tree and that in amount it is directly proportional

to the degree of pathological change in the wall of the gall bladder.

In contradistinction to this mild form of dilatation the gradual partial or complete occlusion of the ducts from stricture produces a most remarkable picture. Here there is a tremendous increase in the diameter of the ducts with stretching and thinning of the walls and consequent obliteration of the pits which form a prominent feature of the normal duct. The process extends more or less uniformly through consecutive branches as far as the fourth and fifth orders. In these situations there is an abrupt transition from dilated to narrow ducts, the actual site of the change depending on the duration and degree of obstruction.

The more severe the hydrohepatosis the further does this transition extend and the more marked the appearance of stubbiness and clubbing of the smaller branches. It is obvious that the great increase in size must be accompanied by a corresponding atrophy of hepatic substance although this is never so marked as to interfere with hepatic function. Humman and Hepler have shown that ligation of the ureter together with partial occlusion of the renal vein is followed by a greater degree of hydronephrosis than simple ureteral ligation. Rous and Larimore (32) have similarly demonstrated the importance of portal blood to the maintenance of the liver. It is interesting to note that in most of our cases the dilatation was more marked and extended further out in the left lobe than in the right. The left branch of the portal vein is long and slender and is given off at a more acute angle than the right. It is probable that the obstruction to the venous flow from lateral biliary pressure produces local parenchymal atrophy and consequently a greater degree of hydrohepatosis in this situation.

Of the conditions producing severe hydrohepatosis the most important are stones in the common duct, stricture following operative intervention and neoplastic obstruction. Of these the first and second are of paramount importance to the surgeon. The point to bear in mind is the necessity for early intervention before the condition we have described becomes established with its train of evil con-

sequences in the shape of atrophy, cirrhosis, and chronic or acute cholangitis. Whether the ducts will return to their original size after drainage we cannot say, although experimental evidence points in that direction.

SUMMARY AND CONCLUSIONS

1. The biliary tree of various types of the liver of man was examined by the celloidin injection and corrosion method in 26 cases.

2. In ten normal livers the common hepatic ducts were found not to exceed 5 millimeters in internal diameter, while the succeeding branches diminished in size to 0.05 millimeter in the fifth order.

3. Out of eight livers in which the gall bladders contained unsuspected stones, a general enlargement of the ducts was found in seven, the dilatation in the common hepatic ducts being between 6.5 and 11.5 millimeters. The dilatation was greater when the associated damage to the gall bladder was more severe. In the case with no dilatation the gall bladder contained three small stones but was otherwise apparently normal.

4. In three livers in which cholecystectomy had been performed for cholecystitis with stones, 8, 9, and 10 days previous to death, dilatation occurred in all but was least marked in a case in which an internal fistula between the gall bladder and colon had been found at operation.

5. In five livers in which benign or malignant strictures of the common ducts existed, the amount of dilatation was very extensive, varying from 10 to 30 millimeters in the common hepatic ducts. The process extended throughout the whole biliary tree, grossly as far as the fifth order of branches. The more complete the stricture and the longer its duration the farther out the extreme change occurred and the more abrupt was the transition from dilated branches to terminal filaments.

6. The associated atrophy of the hepatic parenchyma resulting from the pressure of the enlarged ducts, the obstruction to the portal venous flow from lateral biliary pressure, and the rapidity with which infection from stasis follows are emphasized.

7. The term "hydrohepatosis" adequately describes the condition.

BIBLIOGRAPHY

1. ARCHIBALD E. A new factor in the causation of pancreatitis. *Internat Cong Med (Surgery)* sect vii, 1913 xvii, 21.
2. BEALE L. S. On the Anatomy of the Liver. London: John Churchill, 1836. 80 pp.
3. BOLLMAN J. L., MANN F. C., and DEPAGE PIERRE. The effect of specific cholestyctus on the bile concentrating activity of the gall bladder. *J Lab & Clin Med* 1923, v, 544-547.
4. BRIDGES MAX. The intrinsic blood vessels of the kidney and their significance in nephrotomy. *Bull Johns Hopkins Hosp* 1901 xii, 10-13.
5. COLE W. H. The relation of gastric contents to the physiology of the common duct sphincter. *Am J Physiol* 1923, lxxii, 39-4.
6. FLINT J. M. The ducts of the human submaxillary gland. *Am J Anat* 1901-1922, 1: 269-293.
7. FORD W. W. Obstructive biliary cirrhosis. *Am J M Sc* 1901 cxxi, 65-83.
8. FREERICH F. T. A clinical treatise on diseases of the liver. London: The New Sydenham Society, 1860.
9. GOLDBERG W. Z. Ueber die Blutgefäße in der Niere der Säugetiere und des Menschen. *Internat Monatschr f Anat u Phys* 1893 x, 541-598.
10. HARLEY VAUGHAN and BARRATT WAKELIN. The experimental production of hepatic cirrhosis. *J Path & Bacteriol* 1901 vii, 203-13.
11. HERRING P. T. and SIMPSON S. The pressure of bile secretion and the mechanism of bile absorption in obstruction of the bile duct. *Proc Roy Soc London* 1902, S B lxxix, 517-532.
12. HINMAN FRANK and HEPLER A. B. Experimental dronphrosis. The effect of changes in blood pressure and in blood flow on its rate of development and the significance of the venous collateral system. III. Partial obstruction of the renal vein without and with ligation of all collateral veins. *Arch Surg* 1925 xi, 917-932.
13. HINMAN FRANK MORISON D. M. and BROWN R. K. L. Methods of demonstrating the circulation in general as applied to a study of renal circulation in particular. *J Am M Ass* 1933 lxxxi, 171-184.
14. JUDD E. S. Personal communication.
15. JUDD E. S. and MANN F. C. The effect of removal of the gall bladder—an experimental study. *Surg Gynec & Obst* 1917 xxv, 437-442.
16. KAUSCH W. Der Hydrop der gesamten Gallensystems bei chronischen Cholelithiasisverschluss und seine Bedeutung fuer den Chirurgen. *Mitt a d Grenzgeb d Med u Chir* Jena 1911 xxvii, 138-168.
17. KERNAN F. The anatomy and physiology of the liver. *Philosophical Tr* London 1833 cxxiii, 11-7, 0.
18. LEGG J. W. On the changes in the liver which follow ligation of the bile ducts. *St. Bartholomew's Hosp Rep* 1833 ix, 161-181.
19. LEYDEN ERNST. Beitrage zur Pathologie des Icterus. Berlin: A Hirschwald, 1866. 210 pp.
20. LEVINGSTON L. R. and ROBERTSON H. F. Technique of mounting specimens in a partial vacuum without fluid. *Bull Internat Ass Med Museums* 1926 (In press).
21. MACCALLUM W. G. A Textbook of Pathology. Philadelphia: W. B. Saunders, 1924. p. 328.
22. McINDOE A. H. The effects of cirrhosis on hepatic structure. (Unpublished thesis).

- 23 McMASTER P D BROWN C O and ROUS PEYTON Studies on the total bile III On the bile changes caused by a pressure obstacle to secretion and on hydrohepatosis J Exper Med 1923 xxxvii 685-698
- 24 MALL T P A study of the structural unit of the liver Am J Anat 1906 v 22-308
- 25 MANN F C A study of the tonicity of the pincher at the duodenal end of the common bile duct J Lab & Clin Med 1919 v 10-110
- 26 MARQUIS W J Celluloid corrosion preparation of lungs Bull Internat Ass Med Museums 1916 (In press)
- MARSHALL J A Method for preparing blue celluloid injection material J Am M Ass 1923 lxxxviii 181
- 28 MAYER HILINICH Quoted by Legge
- 29 POTTER J C and MANN F C Pressure changes in the biliary tract Am J M Sc 1926 clxxv 202-217
- 30 ROST FRANZ Die funktionelle Bedeutung der Gallenblase experimentelle und anatomische Untersuchungen nach Cholecystektomie Mitt a d Grenzgeb d Med u Chir 1913 xxvi 710-70
- 31 ROUS PEYTON and LARIMORE LOUISE D The biliary factor in liver lesions J Exper Med 1910 xxxv 249-251
- 3 ROUS PEYTON and LARIMORE LOUISE D The relation of portal blood to liver maintenance demonstration of liver atrophy conditional on compensation J Exper Med 1910 xxxi 609-632
- 33 SNELL A M CRENSHAW C H and ROWNTREE L G Diseases of the liver II A comparative study of certain tests for hepatic function in experimental obstructive jaundice Arch Int Med 1925 xxvii 273-291
- 34 WEBER I LARKES Biliary cirrhosis of the liver with and without cholelithiasis Tr Path Soc London 1903 In 103-135 also Internat Clin 1903 v 13 iii 57-87
- 35 WINCHELSTEIN A and ASCHNER P W The mechanism of the flow of bile from the liver into the intestines conclusions from previous studies Am J M Sc 1926 clxxv 104-111
- 36 WISS O KAR Beitrag zur Histologie der icterischen Leber Virchow's Arch f path Anat 1866 xxvi 553-560

STRICTURED URETERS, HYDRONEPHROSIS AND PYONEPHROSIS OCCURRING IN CANCER OF THE CERVIX UTERI

BASED ON A STUDY OF EIGHTY TWO CASES

BY CHARLES C HILGILL MD AND BERNARD F SCHIRFINGER MD FACs BUFFALO NEW YORK
Sect. Internal Med. N. Y. M. G. N. D. Soc. Buff. N. Y. Nat. T. S. Soc. M.D., D. Recto

A GREAT impression was made on us in the study of autopsies made upon women dying from cancer of the cervix uteri in which postmortem examination revealed stricture and dilatation of the ureters with hydronephrosis or even pyonephrosis. This together with papers by Dr Guy Hunner of Baltimore and Dr Daniel Eisendrath of Chicago prompted us to investigate the condition of the bladder ureters and kidneys in patients suffering from cancer of the cervix uteri. In all there were thirty two autopsies performed. Twenty nine were performed previous to this study and three autopsies were performed on cases included in the clinical study. In an analysis of thirty two autopsies on patients dying from cancer of the cervix, twenty one showed gross pathological changes in the urinary apparatus. These were divided as follows: 4 had stricture of the left ureter with accompanying hydronephrosis, 3 had stricture of the right ureter with accompanying

hydronephrosis, 10 had stricture of both ureters with accompanying hydronephrosis, 1 had pyonephrosis (no evidence of cancer) 1 had a caseous kidney—no evidence of malignant disease in the pelvis but metastases in the lungs. 16 showed marked infiltration into the bladder. 3 showed no bladder involvement but strictured ureters with hydronephrosis, 2 showed bladder involvement with no hydronephrosis.

As a result of this information we made a clinical study of 50 cases of far advanced cancer of the cervix to determine the frequency with which these lesions occur. It was decided to use cases falling in Group 3 and Group 4. By Group 3 we mean cases in which the lesion involves the cervix with definite evidence of invasion of one broad ligament or beginning invasion on both sides. By Group 4 we mean far advanced cases in which there are definite metastases in both broad ligaments and fixation of the uterus. Fourteen of these



Fig 1. Case No 9991. Roentgenogram showing marked dilatation of pelvis and calyces and ureter on right side. Same condition is present on left side but not so marked.



Fig 2. Case No 8484. Left side shows all loss of normal relation of pelvis and calyces and dilatation of ureter. There was no dye on this side. The right side also shows beginning of ureteral obstruction.

cases on cystoscopic examination showed definite ulceration and infiltration of the bladder mucosa in the region of the trigone. The remaining 36 cases showed an elevation of the area just beyond the trigone which was covered either with normal mucous membrane or was edematous in spots. This was regarded as evidence of bladder infiltration which had not progressed to the stage of ulceration. Four of the ulcerating lesions were proved by biopsy. It was thought inadvisable to remove sections unless the mucous membrane was ulcerated. After cystoscopy the capacity of the bladder was measured and then an attempt was made to catheterize both ureters. Kidney function was estimated by phthalein or indigo-carmin intravenous injections after catheters were introduced into the ureters up into the pelvis of the kidneys in cases where this was possible. The patient was then removed to the X-ray room where sodium iodide 15 per cent was injected through the catheters and three X-ray pictures made, one with the catheters in place, the second after the injection of

the sodium iodide and the third after withdrawal of the catheters, effort being made to take in the whole kidney region, ureters, and bladder, to show strictures in the broad ligament area or at the brim of the pelvis as well as the dilatation of the ureters. The phthalein function was 30 per cent or less in 15 minutes in 8 of 22 cases tested, 14 cases had function varying from 30 to 62 per cent. Five were without any obstructive lesion and the remaining 9 cases showed some evidence of ureteral or pelvic dilatation. It is a noteworthy fact that at the time of injection, those cases that were practically free from stricture and dilatation of the ureter on dilating pelvis, complained of more pain in the back and disturbance for 24 hours following than did those in which marked pathology was found. It was rather surprising to find that in 6 cases we were unable to pass a ureteral catheter beyond the strictured area on one side after repeated attempts with catheters varying from No. 4 to No. 6, using at times even a stylet in the catheter. These obstructions occurred most frequently in the lower 2 inches of the ureter.



Fig 3 Case No 9160. Roentgenogram showing marked dilatation of pelvis of left kidney and dilatation of ureter. Right side was almost totally obstructed as a catheter could not be passed through the ureter and no dye came through from this side in 20 minutes and in same period function from left kidney was 30 per cent.



Fig 4 Case No 9224. Roentgenogram showing marked dilatation of pelvis and ureter on the right side. Six per cent dye in 15 minutes from right side. Catheter could not be passed through ureter on left side and no dye came through from this side. Autopsy 1 month later showed double hydronephrosis.

Twenty four of the 50 cases showed hydronephrosis or dilatation of the ureters due to stricture of varying degree in one or the other ureter or both. This was divided as follows: left ureter 6, right ureter 11, both ureters 7. This varied from a moderate degree to a marked degree of hydronephrosis with almost total loss of function. These facts were borne out by bimanual examination.

DISCUSSION

In considering these findings the question naturally arose as to what was the cause of the strictures in the ureters resulting in the dilated ureter and hydronephrosis. Is it due to the direct pressure from involvement of the broad ligaments or bladder wall or is it the result of fibrosis following radiation treatment of cancer of the cervix? It would appear from an analysis of the material studied that this condition existed prior to any form of radiation

as well as during the progress of healing 4 to 8 weeks following radiation or even months after radiation. These cases were routinely treated with tandem tubes of radium in the cervical canal, filtered through 2 millimeters brass and 1 millimeter rubber for a total of 1,200 millicurie hours per tube, supplemented with divided doses of high voltage X rays so that the total dose approximated 130 per cent, 3 to 5 centimeters from the tubes.

CONCLUSIONS

1. We, therefore, conclude that these strictures are the result of pressure on the ureter from invasion of the broad ligament or bladder wall which possibly may be made worse as the result of fibrosis in the healing of these lesions.

2. Cases which were classified as Group 3 or Group 4 gave 50 per cent obstruction to ureter, with hydronephrosis or pyonephrosis.



Fig 5 Case No 9457 Roentgenogram showing dilatation of both ureters and ptosis of right kidney

3 Even after complete eradication of the disease by radiation one patient died from kidney insufficiency in which autopsy showed cervix, uterus, and broad ligament areas free from cancer

4 In all these cases undoubtedly the metastases and infiltration in the broad ligament areas or bladder wall, were responsible for the occlusion of the ureter on one or both sides

5 So far as we were able to ascertain, there has been no systematic study made of the



Fig 6 Case No 7031 Pyelograms of a Group 4 case which has been clinically well 3 years after beginning treatment There is some clubbing of the calyces and a little dilatation of both ureters

urinary apparatus with functional kidney tests, cystoscopy and pyelograms in cancer of the cervix uteri

REFERENCE

- SCHREINER B F Clinical results after irradiation of cancer of the cervix uteri New York State J Med 1924 December

COINCIDENT CANCER AND MELANOSIS OF THE BOWEL

WITH REPORT OF A CASE

BY MILLS I. PORTER, M.D., FORT WANE, INDIANA

CONSULTING more than half a dozen textbooks on diseases of the rectum and colon the writer found but one that considered the subject of melanosis of the large bowel and none that said anything about the coincidence of melanosis and tumors as unconnected conditions.

The one author who considers melanosis of the large bowel as a distinct condition is Lynch¹ who says the disease is comparatively rare.

He credits Peck with having collected 18 cases and further says that the disease is limited strictly to the mucous membrane that it is more marked in the cecum that it gradually fades toward the rectum that it begins at the distal surface of the ileocecal valve and that the glands are not involved.

In a personal letter Ewing says 'Melanosis is a rare but well known complication of tumors of the cecum and is due to the chronic stasis which arises in some of these cases. It has no relation to melanosarcoma. Ewing has

DISEASES OF THE RECTUM 1010 p. 377

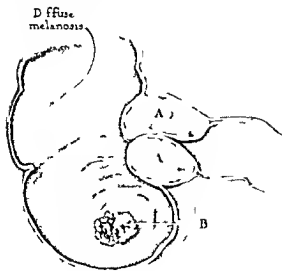


Fig. 1. Drawing showing specimen of melanosis of the bowel.

'seen more cases without tumor than with' and thinks that the two conditions in the case herewith reported are 'entirely unconnected'.

CASE REPORT

Mr. F., aged 62, came to operation January 2, 1926, with a working diagnosis of ileocecal obstruction probably malignant. On opening the abdomen and after releasing adhesions between the omentum, parietal peritoneum and bowel we found a tumor of the lower end of the ileum the size of a pullet's egg. About 6 inches each of the ileum and cecum was excised and an end to side anastomosis with the aid of a Murphy button done after we ascertained that there were no glandular liver or other metastases present.

On dividing the cecum I was surprised to note that the mucosa was black. Cross examination of the specimen showed what seemed to be an encircling cancer of the ileum at the ileocecal junction. There was a general ink black melanosis of the mucosa of the cecum.

The appendix was not found but at what seemed to be the opening of the appendix into the cecum there was a small papilloma, part of which was dark red and part black. The mucosa of the ileum seemed normal. The discoloration of the mucosa of the cecum ended abruptly at the ileocecal junction. The cut surface of the tumor of the ileum showed no pigmentation (Fig. 1). The melanosis results from deposits of pigment in the subepithelial cells (Figs. 2 and 3). Dr. Ewing suggests that the pigment is

probably derived from some specific bacterial infection. Sections from both the papillary growth (Fig. 4) and the growth in the ileum (Fig. 5) show an absence of pigmentation.

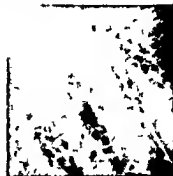


Fig. 2. Melanosis of mucosa of cecum. Note that the pigment is deposited in the subepithelial cells.



Fig 3 Melanosis of mucosa of cecum. Note that the pigment is deposited in the subepithelial cells



Fig 4 Section of papillary growth in cecum. Note absence of pigment. Gelatinous adenocarcinoma



Fig 5 Section of the growth from the ileum. Note absence of pigmentation. Gelatinous adenocarcinoma

The specimen was examined in three different laboratories and all the pathologists agreed on the diagnosis of gelatinous adenocarcinoma. Dr. Ewing's first report on the specimen was not quite clear to me on some points so I wrote asking him to clear them up. He very kindly replied as follows:

I could not clearly identify all the structures in the bowel tumor specimen. The main tumor projects as a papillary mass into the large intestine. It involves the wall of a small segment of ileum but appears to be outside of the ileum since the mucosa in this segment is unaffected. Since I could not find the appendix I concluded that the tumor must arise in the appendix and that the ileum entered at another point. The specimen does not reveal whether the ileum enters the resected bowel.

Your own observations can best determine whether the tumor surrounded and occluded the ileum. If it did then the tumor was primary in the ileum. I cannot prove this from examination of this material. I made a section from the whole wall of the tumor. The papillary growth is merely an extension of the main tumor. There are not two tumors but only one. It seems most probable that the tumor

is primary in the ileum at the entrance into the cecum.

'I think that the tumor itself has been fully removed so far as one can see. Terms of colloid carcinoma and gelatinous carcinoma carry identical meaning.'

When the melanosis was first disclosed to the operator at the time the bowel was sectioned he having in mind melanosisarcoma thought he was doing a futile operation, but on closer examination of the specimen and especially after getting the reports from the pathologists to the effect that the melanosis and malignancy were distinct processes and that the carcinoma "seemed to be fully removed" he concluded that his patient had a good chance for a temporary cure and an ordinary chance for a permanent cure.

It should be added that up to the present, the patient's condition is entirely satisfactory.

HEMIMYPERTROPHY

By LAURYNCE H. MAYERS, A.M., M.D., CHICAGO

From the Medical Service at St. Luke's Hospital

AN interesting and classical picture of the rare anomaly of development known as hemimypertrophy is offered in this report with accompanying photographs of E. H., a girl of 9 years who appeared December 7, 1925, as a patient at the Outpatient Department of St. Luke's Hospital for examination into causes of a vague chest pain experienced after strenuous exercise and signs of early fatigue, noticeable particularly on the left side.

The entire right side of this patient participates in an enlargement involving subcutaneous tissues, muscles and bones. The condition was apparent at birth. It has been non-progressive and the symptoms for which it has been responsible have been mechanical rather than organic or functional in type.

Hemimypertrophy though readily recognizable is by no means simple of explanation. The lateral asymmetry of form may be so definite as to affect the tongue and neck, and it may involve imbalance of all the paired organs, both internal and external. The dissimilarity of the two sides of the face may be so striking as to suggest that the opposite sides really should belong to different persons. Indeed, Arnold Gesell advances the opinion that the anomaly differs only in degree from certain aberrations in the twinning process which at one extreme produces two separate beings at a single birth but which under normal conditions is limited to the normal pairing noted in all bilateral organisms.

The forty cases of true hemimypertrophy which have found a place in medical literature and the thirty other reported cases of partial or crossed hypertrophy have been the source of so much medical speculation that it has seemed worth while to investigate with pains taking zeal the case herein reported. Precise physical measurement therefore has been supplemented by a much more extensive family and personal history than accompanies the early recorded cases, and also the full re-

sources of the laboratory have been utilized to bring out any possibilities of obscure disorder or functional imbalance that could properly be ascribed to the dystrophy shown. By such careful method we may safely state that E. H. is in good health, that her left side is normal for a girl of 9 years, and that the right-sided enlargement is the only anomaly shown. This is to say that the findings throughout indicate a case of true hemimypertrophy.

Physical examination shows E. H. to be intelligent, fully well nourished and apparently in good health. She is active at play and enjoys it though on her own statement her endurance is less than that of other children of her own age. The right side is less agile than the left and sensations of heat and cold are exaggerated on the left side. Vision, hearing, taste and other sensations are normal but her mother reports the occasional sudden appearance of ashy paleness without any acknowledged concomitant physical discomfort. She sleeps well, has had no headaches or other unfavorable symptoms other than some shortness of breath after strenuous exercise. Reflexes and other functions are normal.

There is a marked disproportion in the two sides of her body. The left side is apparently normal in size for a girl aged 9. The entire right side of the head, face, neck, chest, arm and leg are noticeably larger than the left. The height of the two shoulders is about equal but the difference in the length of the leg on the right side causes the crests of the ilia to assume different levels and a slight scoliosis is the result. The disproportion in the two sides is much greater in the face and below the crests of the ilia than in the arms and chest. The two hands are equal in size. The eyes are round and of equal size but the nose is somewhat displaced laterally and the ala is prominent on the right. The right auricle is much larger than that on the left. Muscular disproportion is noticeable in the neck. The

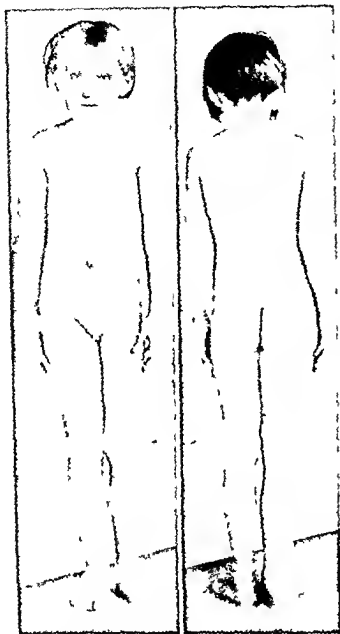


Fig 1 Front and back views of patient

right foot is full and thick and exhibits an unusually high arch

The hair on the right side of the head is slightly coarser in texture than that on the left. The skin is thicker on the right side and rather resembles a scleroderma. It is especially thick and hardened in the legs and feet. The skin is paler in color on the right side, and this region perspires profusely and emits a peculiar odor. The skin is free from eruptions, and there is no sign of the pigment changes or naevi which some authors consider characteristic of hemihypertrophy.



Fig 2 Composite roentgenogram of bones of patient's body. The bones everywhere participated in the right-sided enlargement proving that the overgrowth extended to all tissues of mesoblastic origin.

No unusual factors are forthcoming in family or personal history which would throw any light on the cause or course of the condition. The entire right side was noticeably enlarged at birth. The rate of growth has been the same on both sides and the disparity has not increased. The comparative measurements are as follows:

BODY MEASUREMENTS

Weight	55 pound
Height	50 inches
Span	123 centimeters
Head	Centimeters
Fronto-occipital	52.5
Superior maxilla	48.0
Inferior maxilla	44.0
Occipitofrontal	46.0
Verticomenal	58.5
Neck at thyroid	26.5
Arm	Centimeters
Arm at insertion of deltoid	Right 18.0 Left 15.5
Forearm—upper third	19.0 16.0
Forearm—middle	14.0 14.0
Wrist	12.5 12.0
Metacarpophalangeal joints	14.0 14.0
Acromium to olecranon	26.0 25.5
Olecranon to styloid	18.5 18.5
Styloid to tip middle finger	15.0 16.0
Chest at second rib	62.0 58.0
Chest at ensiform	55.0
Abdomen at umbilicus	54.5
Abdomen at trochanter	63.5
Thigh	
Upper one third	41.5 35.5
Lower one third	32.5 26.5
Mid calf	28.0 24.0
Ankle above malleolus	19.75 15.75
Across in top	21.0 18.0

evidence is adduced to show that all paired organs share in the disproportionate development in this case but it is probably no exception in this matter or in the fact that the hemihypertrophy is in direct relationship to the dominant cerebral hemisphere.

No evidence of mental inferiority in this case bears out the thesis of Arnold Gesell that hemihypertrophy should categorically be linked with mental inferiority but the nervous tendencies noted suggest that right sided hypertrophy in the cranium may conduce some nerve disequilibrium. Other physical and laboratory findings are in general negative.

The forty cases of true hemihypertrophy reported in the literature and the thirty other partial or crossed cases show a preponderance of males and a predilection for the right side. Only five true cases occurred in adults and the data in the series as a whole are incomplete and unsatisfactory as to the mental status of the patients. Many of them were children in whom mental deficiency signs might not be very apparent. Few reports give consistent clinical findings other than physical measurement. Only one case in the literature carries the statement that the condition was progressive. All evidence goes to show that hemihypertrophy is congenital in origin having as its basis a defective anlage. It is not progressive and is not in itself a stigma of degeneracy.

Its course and congenital origin are in distinct contrast with the dystrophies marked by abnormal disposition of fat cerebral or glandular in type and always of postnatal origin. Arnold Gesell's inclination to find an analogy between the general asymmetry of hemihypertrophy and the known relationship between right sided cranial enlargements and feeble mindedness is well supported in his able discussion of the biological process of twinning which underlies the evolution of paired organs. It is impossible to postulate the particular varieties of influences which operate as early as within the first 4 weeks after impregnation, or perhaps within the ovum itself, to give one side of the human body a growth advantage over the other, but any advantage so acquired is never lost. The case of Gotch according to Gesell had a growth advantage

Elaborate and painstaking laboratory investigation revealed nothing abnormal or in any way unusual in metabolic rate, regional temperatures, blood findings or urinary function. Under X-ray examination the bones are shown to participate everywhere in the right sided enlargement and proved the prediction that the overgrowth extended to all tissues of mesoblastic origin namely the subcutaneous tissues, muscle and bone.

This case is a noteworthy example of true hemihypertrophy in contradistinction to similar conditions of partial or crossed cases involving one or more members or enlargement of the face with corresponding enlargement of members on the opposite side of the body. No

of a year beyond that of the opposite side as measured in terms of erupted teeth. Many and various causes may induce this particular type of developmental anomaly, but the result in every case has been the breaking down of some inhibition to growth, and the cells continue to go wild thereafter.

No human being is exactly the same on both sides and seemingly insignificant discrepancies of this kind according to H. H. Newman, may account for many personality deviations as well as physical imbalance. In this connection he makes the significant observation that growth-retarding agents may be utilized in experimental work to produce in embryonic fish specimens characterized by rapid growth on one side which results in curved and spiral variations in form. Thus he postulates that a very slight isolation in early embryonal life may produce a one-sided growth advantage that remains permanent in the human form. He is in agreement with Arnold Gesell that the twinning process in bilateral organisms is open to many conditions that make for imbalance and the wonder is that we encounter hemihypertrophy so seldom.

Routine medical histories taken along conventional lines with the purpose in view of

proving the presence of disease are not sufficient to clear up questions involving developmental anomalies that influence individual constitution. Morphogenesis increasingly enters into questions of diagnosis. The mechanism of growth cannot be considered apart from diathesis and personality deviations too, need to become in every case an integral part of clinical observation.

BIBLIOGRAPHY

1. BISSON I. E. T. Unilateral hypertrophy involving the entire left side of the body. *Am J Insanity* 1912 lxxv 91.
Idem. *Endocrinology and Metabolism* New York Appleton p. 937.
3. CESSLE ARNOLD. Hypertrophy and mental defect. *Arch Neurol & Psychiat* 1911 p. 400.
4. HASSAN. *Abt's Pediatrics* vii pp. 321 and 324.
5. FISHER H. Congenital total hypertrophy. *J Am M Ass* 1914 lxxv 1046.
6. LUSTBERG. Persistent congenital hypertrophy of the right lower extremity. *Arch Pediatr* 1911 lxxv 662.
7. MOHR G. J. Complete left hypertrophy. *Arch Pediatr* 1925 lxxv No. 5 339.
8. REED A. C. Congenital total hypertrophy. *New York M J* 1913 cxviii 483.
9. NEWMAN H. H. *Hemihypertrophy—the Physiology of Twinning*. University of Chicago Press 1923 p. 159.
10. STANTON JAMES N. and TUST LOUIS. Congenital total hypertrophy. *J Am M Ass* 1923 p. 1432.

TRAUMATIC PNEUMOCEPHALUS

AN ANALYSIS AND REPORT OF A CASE¹

By W. O. BULLOCK, M.D., F.A.C.S., LEXINGTON, KENTUCKY
Lexington, C. K.

THE presence of air within the cranial cavity, the result of injury, has been brought to our attention in recent years with increasing frequency. Hydropneumatocele, hydropneumocranium, traumatic pneumocele of the ventricle, arocele of the brain, traumatic pneumoventricle and pneumocranium are terms used sometimes without discrimination to describe the condition. A simpler and better term would be pneumocephalus. Hydrocephalus (water head) is not only descriptive of a condition but it was also a familiar word hundreds of years before the pathology of the condition it described was known. The replacement in part of fluid by air in the cranial cavity should make the use of the term pneumocephalus preferable. Moreover we find hydrocephalus divided into two classes, the internal and external hydrocephalus in accordance with the location of the massive fluid collection. A similar disposition is found to exist with air collections which may with equal propriety be designated as internal and external pneumocephalus. This arrangement should serve to co-ordinate and simplify a terminology which seems at present to be running wild.

CASE REPORT

T. J. F., male, age 60, referred by Dr. H. S. Cilmore of Owingsville, Kentucky, entered Good

Samartan Hospital on July 8, 1925. On May 18 patient was kicked in the head by a mule. He says he was not wholly unconscious and started to walk to the house but became sick and was carried in. The accident occurred about 2 p.m. and until 11 p.m. he bled from the nose in a steady stream. During this time he vomited blood frequently. The eyelids swelled and there was ecchymosis. There was some blood from the right ear. The conjunctivæ were never suffused with blood. The right eye was involved first, then the left. The swelling lasted about 1 week. The patient was in bed for 3 weeks and during this time was clear mentally and showed no loss of memory. He had no paralysis or twitching but he complained of severe head ache.

After 3 weeks he got up and was up for 2½ weeks. During this time the headaches persisted and became progressively worse. Occasionally he spat up a little blood. He sneezed and coughed some at various times but had no bad coughing spell. Three weeks prior to admission he had such severe headaches that he went to bed. The pain was worse in the back of the head. After being in bed 3 days he had a profuse discharge of clear fluid, estimated at about a pint, from his nose and with this discharge the headaches were relieved. From this time also he would void and defæcate involuntarily and his mental processes became clouded. The condition has not changed since first discharge of fluid from nose.

Physical examination showed nothing abnormal in the skin, thyroid, peripheral arteries, heart, lungs, abdomen, liver, kidneys, spleen, spine, joints and extremities. There is a depressed fracture of the right frontal bone over the right eye extending vertically 1½ inches. Clear fluid drips from the

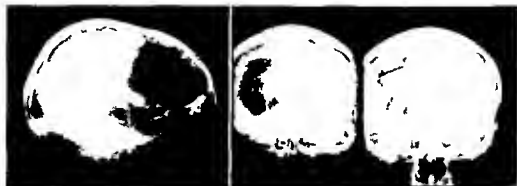


Fig. 1. Lateral and anteroposterior roentgenograms of author's case.

nose when patient assumes sitting position—amount 2 to 3 ounces

X-ray examination July 8 of the skull shows that there has been a fracture of the right side of the skull. The fracture line extends through the base of the nose and lateral side of the orbit up the frontal bone just in front of the coronal suture. The character of the fracture suggests that the patient was struck with a sharp instrument and air has been introduced into the cranial cavity and into the ventricles which are beautifully outlined (Jno A. Herring)

Neurological examination reveals a well developed and nourished male. No anemia or jaundice are present. He has a slight exophthalmus. The pupils are contracted, equal and respond promptly to lights. Ocular movements are limited upward and laterally. No increased ocular tension is found. Patient presents mild confusional psychosis is not oriented for recent events or time. Speech is slow and hesitating. General muscular coordination is only fair. Tactile sensation is probably normal but lack of cooperation makes test doubtful. Pain and temperature sense is normal. Hyperaesthesia of extremities is increased. The patellar reflexes are markedly exaggerated. No Oppenheim or Babinski sign. No ankle clonus. He has incontinence of urine and feces. Spinal fluid is under no pressure so that position and forced breathing was necessary to obtain specimen (C. N. Kavanaugh)

Laboratory examination of spinal fluid July 11 1925 showed Amount 13 cubic centimeters appearance slightly turbid globulin 1 plus, cell count 13 mononuclears 13 bacteria none culture no growth Wassermann, negative

Fluid from the nose added in doubled amount to Benedict's solution produced a slight reduction

Eye ear nose and throat examination showed pupils contracted limited ocular movements to left and no upward movement of eye balls fundus negative. The ear drums were all right. Clear water fluid was collected from the nostrils but we were unable to tell from what part of nasal fossa it comes. The nasopharynx is negative (W. J. Greenfield)

Operation was done July 12—exploratory craniotomy and puncture of ventricle. A skin flap was made over the depression. The depressed portion of the bone was removed. The dura was loose and flaccid. There was no evidence of any intracranial pressure indeed the reverse was the case. Inasmuch as there was a space between the dura and the brain extending around the frontal lobe the brain itself seemed to fall and rise with each respiration. A small trocar was pushed through into the ventricle but there was no difference in pressure and no air escaped. The wound was closed leaving a small rubber tissue drain.

Progress July 16 some reddish ordema was present about the right lids. Patient voids involuntarily. Temperature is 99.2 degrees

July 17 patient is very restless getting out of bed. Axillary temperature is 100.2 pulse 120-130. He does not swallow food but holds it in his mouth.

July 20 condition continues about same but patient is weaker. He is delirious getting up from bed. The reflexes are exaggerated—hyperensitive. Rigidity of neck and back are present meningitis (?) Temperature 99 to 101.8 pulse 70 to 128 respirations 22-34.

July 21 patient's condition is much worse. The eye is congested with rotary nystagmus. Temperature is 102 plus. Unconsciousness persists.

July 22 expired at 1:10 a.m. Post mortem examination was not permitted.

INCIDENCE

Luckett (9) reported the first case in 1913 under the title "Traumatic Pneumoventricle", Grant (5), in 1923 reported a case and presented a review and tabulation of 10 cases. The present paper is based on a study of these 11 cases plus a second case of Luckett's (10), one by Sir William Wheeler (18) one by McCannel (12) one by Teachenor (17) and the one here presented (Case 16).

Potter (13) says 'It is probable that many cases of intracranial air are overlooked because of the infrequency of roentgen ray examinations 2 to 3 weeks after the injury when pneumatic sinuses are fractured into'. While this may later be shown to be true there is little in the facts developed by this study to justify its general acceptance.

MECHANISM

The manner in which air enters the cavity of the brain is still conjectural to a large extent. It has been suggested and quite generally accepted that it reaches the inside of the cranial cavity by being forced up through the fractured sinuses of the frontal bone—the ethmoid or the sphenoid, by the acts of sneezing coughing or blowing the nose, and since the majority of reported cases show fractures through the frontal and ethmoid cells, and since the larger number of air pockets occupy the frontal region, this seems the most reasonable explanation. There are however, cases in which the injury has been in the parietal region. Cases 11 and 9 of this series show injury in such a location. The above explanation would not hold to account for the presence of air in these cases. It is pos-

No	Auth	Air on First Exposed	Time of Appearance	Outlining Symptom	Op	L	D	Case of Death
1	Luckett	Yes	26 days	Pupure	Yes		D	Meningitis
2	Pittier	Yes	19 days	Necrosis	No	L		
3	May	Yes	Immediately	Fatal	Yes		D	Tuberculosis
4	Skin	Yes	4 weeks	Hemiparesis and paresis	Yes		D	Meningitis
5	Hillman	Yes	Immediately	Meningitis	Yes		D	Meningitis
6	Hillman	Yes	1 month	Altered mental state, Right iliofemoral aneurysm	No	L		
7	Dyke	Yes	1 month 6 days	Pupure	Yes		D	Cerebral path
8	Cotte	?	9 months	Pupure, cerebrosplenic fistula	No	L		
9	Emboden	No	32 days	Epilepsy	No	L		
10	Glennard and Armstrong	?	1 month	Pupure, cerebrosplenic fistula	No	L		
11	Lusk	Yes	3 days	Dizziness, headache	Yes	L		
12	Gant	Yes	3 days		Yes	L		
13	Tach	Yes	Immediately	Mental confusion, hemiparesis	No	L		
14	Wheeler	Yes	Immediately	Leucorrhea	Yes		D	Meningitis
15	McConnell	No	3 weeks	None	No	L		
16	Bloch	Yes	1 month 20 days	Pupure, cerebrospinal fluid	Yes		D	Meningitis

L. Lusk, D. D. I.

sible that following a fracture through the petrous portion of the temporal bone opening into the tympanic cavity the patient by the expulsive efforts above mentioned or in his stertorous efforts at respiration might force air back through the eustachian tube into the middle ear and thence into the cranial cavity. Nor do either of these explanations fit the cases in which air is found in the cranial cavity immediately following the accident as occurred in several of this series. To account for the condition under these circumstances we may assume that as a result of the sudden application of force to the skull there is in some way produced a certain degree of negative pressure within the calvarium and that into this vacuum there is aspirated ahead of the expanding brain a certain amount of air at the time of its occurrence or within a short time thereafter.

TIME OF APPEARANCE

It seems to be the general impression among those who have written on the subject that the presence of air within the skull does not follow immediately after the accident but that it makes its appearance after

a period from 2 to 3 weeks. We find in this series that air was definitely present

	Number of cases
Immediately or within 4 hours	5
In 19 days	1
In 21 days	1
In 28 to 32 days	5
In 60 to 90 days	3
In 9 months	1

We find that air was definitely present on the first X-ray films in 10 cases, that air was definitely absent on first plates in 3 cases, that in 2 cases the record is silent on this point, and that in one case no plates were made. That is to say, that with few exceptions the early plates showed the condition early, the late plates showed the condition late or in other words it is the recognition of the condition rather than the condition itself that appears late, and there is reason to believe that a more careful study of early plates will be more enlightening in determining the diagnosis than later ones.

CLASSIFICATION

From a study of the assembled films it is not difficult to note that there are three distinct forms of pneumocephalus.

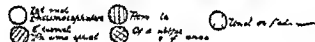
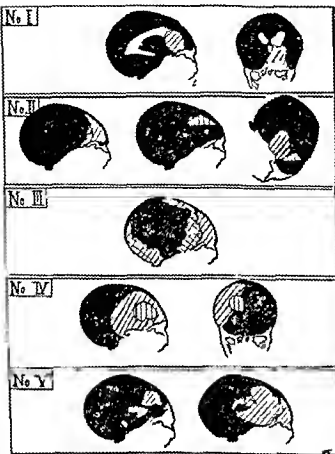


Fig 2 Drawings of roentgenograms in Cases 1 to 5

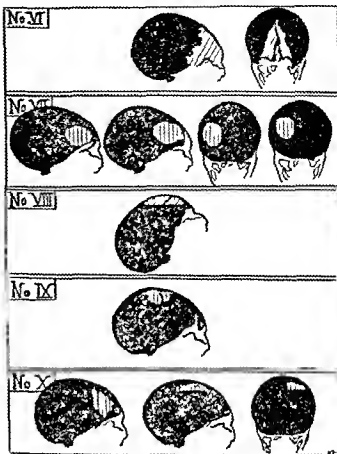


Fig 3 Drawings of roentgenograms in Cases 6 to 10

1 The diffuse subdural type, external pneumocephalus. This appears on the plates as an area of diminished density usually without definite outline and as a rule the ventricle are not visualized. This type is the primary stage in the formation of both the other two types. The pneumocephalus in this form may be limited to the immediate region of the fracture as in Case 6 in which it seems to have passed for a short distance between the cerebral hemispheres. It may spread itself out over the side of the brain as in Case 3 or it may form a large air cap covering the convexities of the frontal lobes Cases 8 and 16.

2 The pneumoventricular type, internal pneumocephalus, in which the ventricles are filled with air and usually distended and distinctly outlined on the film. This type may occur alone or in combination with Type 1

From the fact that to reach the ventricle air must pass through the subdural space, pure internal pneumocephalus of traumatic origin exists only after the subdural air has been completely absorbed. The access of air to the ventricle may be direct through the damaged frontal lobe which closes valve like after admitting the air and letting out the fluid. The access of air into the ventricle may, on the other hand, be indirect through a rent in the arachnoid passing through the cisterna magna the foramina of Magendie and Luschka through the iter and the foramen Monroe. Certainly in some of the plates the region of the cistern stands out with great distinctness, although this may be an artefact. A possible route is mentioned by Teachenor as being through a rent in the floor of the third ventricle at the postchiasm space.

3 True arocele a circumscribed accumulation of air within the brain itself. Here as in the preceding type, external pneumo

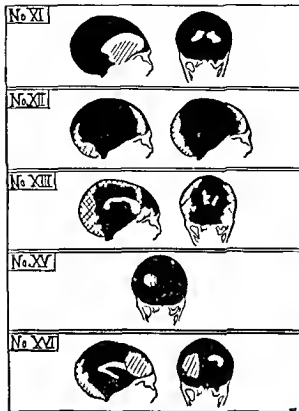


Fig. 4. Drawings of roentgenograms in Cases 11, 12, 13, 15 and 16

cephalus is the primary stage. The trapped cushion of air is compressed between the brain and the dura. If the brain is uninjured the condition is static but if laceration of brain is concomitant the compressed air enters the hiatus displaces the damaged brain tissue and forms for itself a lodging place the extent of which corresponds to the extent of brain damage (Spiller) and to the degree of pressure. The development of air cysts by replacement of air by fluid the microscopic study of postmortem condition was first described by Barbe and Glenard (1) and by Glenard and Aimard (4). Spiller (15) has contributed to the knowledge of the subject reporting his postmortem findings on a similar case. Quoting Glenard and Aimard (4): "It can be said that the walls of the aerocele are formed going from the superficial to the deep first by a thick membrane analogous to the ventricular endyma, then by a

zone of sclerosis and lastly by fibers having the appearance of normal myelinization. Spiller (15), however, found no such ependymalike membrane lining the cyst wall. After existing for variable periods, the air in the aerocele may be gradually replaced by fluid. On the other hand, from the histories that have been submitted it is quite evident that some of the cases of aerocele resolve themselves by gradual absorption of the air and its replacement by brain tissue. The manner in which resolution of aerocele of the brain takes place will probably be found to depend upon the presence or absence of adequate communication between the air pocket and the subdural space or, possibly, the ventricular space.

When the air in these air cysts is partially replaced by fluid, the roentgenogram shows a very definite water line which changes its position according to the position of the head. The diagnosis of aerocele of the brain may be made only when the stereoscopic roentgenogram shows a distinct cavity within the brain itself or when flat plates in two directions show a limited well defined cavity within the brain. Not all the cases of intracranial air which show a definite water line are to be interpreted as aerocele. I regard Case 8 as one of subdural type.

In Case 16 operation was carried out partly on the mistaken interpretation of the plates by the roentgenologist. The anteroposterior views in this case seemed to show a greatly dilated ventricular space the lateral view seemed to show an aerocele. Upon opening the skull however we found that there was no dilatation of the ventricles there was no aerocele of the brain, and that the area of diminished density was due entirely to an air cap surrounding the convexities of the frontal lobes. Had a roentgenogram of this case been taken from side to side with the face up it would have shown a water line similar to that in Case 8.

The cases herewith are analyzed and classified as follows: external pneumocephalus Cases 3, 5, 6, 8, 12 and 14, internal pneumocephalus (pure), none, aerocele of brain Cases 2, 4, 7, 9 and 10, combined internal and external pneumocephalus Cases 1, 11,

13 and 16, unclassified because of insufficient data, Case 15

TREATMENT

From a consideration of the operative results, it is evident to the most complacent that surgical attempts to relieve this condition have been either unnecessary, inopportune, improper, or insufficient. Spiller (15) says "The question of operation is a difficult one. If it is to be performed early, it will be before any evidence of aerocele exists, and will be done in the hope of preventing this lesion. It is not customary to operate on every case of linear fracture of the skull without displacement of fractured bone and without signs of intracranial pressure, and it seems questionable whether operations would be advisable wherever the roentgen rays show a linear fracture permitting communication with air sinuses. In some instances it is difficult or impossible to be certain from roentgen ray examination whether an air communication with the interior of the cranium has been established. Presumably where such communication is shown by roentgen-ray plates taken shortly after fracture has occurred, operation might make closure of this communication possible and thus prevent the development of an aerocele, and the possibility of the development of an aerocele must be considered in every case of fracture of the bones about the nose. It would be difficult to prevent the patient from blowing the nose and sneezing in the presence of such fracture, but something might be attempted in this direction to lessen the danger."

Grant (5) says "The presence of a pneumocranium immediately after the injury is an indication for operation at once to attempt to close the dural tear, thus minimizing the danger of infection. If the air is unexpectedly discovered after 5 or 6 days, when the sinus may have spontaneously closed, and if on repeated X ray the quantity of air shows no increase and is causing no symptoms, a policy of watchful waiting should be instituted. Air *per se* once the possibility of infection can be excluded is relatively innocuous, it will be absorbed and

no harm result. The patient should be warned against coughing or sneezing, which might reopen the sinus and force more air into the subdural spaces. Urotropin should be administered. The nose should be douched gently with a weak antiseptic solution."

Wheeler (18) says "In view of the high mortality from infection to the meninges in fractures of the base of the skull communicating with the external air, and notwithstanding the general trend of opinion in favor of operation, it seems questionable whether treatment along conservative lines would not be followed by better results. Prophylaxis in the form of careful attention to the orifice through which blood and cerebrospinal fluid are escaping, and the administration of urotropin and its derivatives, will tend to prevent infection better than drainage."

Unquestionably, whenever signs of pressure arise in these cases, relief of pressure is indicated, but the methods hitherto proposed and carried out seem to favor the development of meningitis.

Of the 8 cases in which no operation was done, there were 7 recoveries (one of these was already dead when the plates were made). Of the 8 cases in which operations were performed, there were 2 recoveries. This comparison is not altogether fair because certainly two of these latter would have perished had no effort been made to save them, and the symptoms in others were more or less urgent. However, upon closer inspection we find that in Cases 1, 4, and 14, there was immediate improvement following operation, to which there succeeded after an average interval of 10 days, meningitis and death. Of the other fatal cases, Cases 5 and 16 died of meningitis and Case 7 died as the result of cerebral disease. Of the cases operated on which recovered, Case 12 recovered apparently in spite of, rather than because of, operative interference, and Case 11 appears to be the only case of recovery in which relief may reasonably be attributed to the operation, and in this case, according to Holmes, brain abscess subsequently developed.

The explanation of the sequence of improvement followed by meningitis may be interpreted as follows. The operation

SURGERY GYNECOLOGY AND OBSTETRICS

secured decompression the air within the cranium while not germ free, did not contain sufficient organisms to set up inflammatory reaction, the superimposed trauma of the operative procedure with its accompanying devitalization of tissue and local reaction was just enough to start the conflagration.

We may assume that no operation of any kind should be done unless symptoms referable to intracranial pressure develop. To do these latter cases decompression should be done with the least possible trauma. To decompress a toy balloon requires but the prick of a pin. In traumatic pneumocephalus with increased intracranial pressure we have a toy balloon the coverings of which are the walls of the skull the scalp and the dura. A small incision through the scalp a drill hole through the bone and a small hollow needle through the uncut dura into the air pocket will secure the desired effect be the accumulation subdural within the brain or in the ventricular cavity. Aspiration should not be necessary for air not under pressure will not produce symptoms and will be rapidly absorbed.

I believe that efforts directed toward closing the portal of entry of air are not only useless but actually harmful on account of the trauma that must necessarily accompany such effort. Even in those cases in which there is persistent discharge of cerebrospinal fluid from the nose of which there were three in this series in whom the condition persisted for more than a month in none of these cases did meningitis develop except in Case 16 when it followed operative

opening of the skull. While I do not look upon a persistent fistula of this kind as harmless I do believe its danger is greatly increased by surgical interference. Where active meningitis has already developed to a sufficient extent to warrant interference surgery along established lines may be of service.

In the case here detailed I feel that the operation done calls for a plea of guilty on three counts namely it was inopportune unnecessary and improper but this opinion was formed only after a careful study of all the literature on the subject.

For the purpose of showing the different types of the condition the hitherto reported cases are reproduced diagrammatically.

BIBLIOGRAPHY

- 1 BARBI and GLENNARD Press méd 1919 July 36
(177) Bull et mém Soc de chir de Par 1919
XIII 363
- 2 BAILLARD Ann J Roentgenol 1921 VIII 3
- 3 GLENNARD and BAILLARD Tre se méd 1919 Mar 10
1923
- 4 CRANT FRANCIS C Surg Gynec & Obst 1913
XXIII 351
- 5 HUBBARD C W Ann J Roentgenol 1918 V 334
- 6 HUBBARD C W Ann Surg 1921 XXIII
Vol II
- 7 LICKETT W H Surg, Gynec & Obst 1913 XXV
23
- 8 LICKETT W H Surg, Gynec & Obst 1913 XXV 36
- 9 MANN K J Am J Roentgenol 1919 VI 13
- 10 MCCANNELL Laryngoscope 1923 XXXIII 159
- 11 LOTTER H F Am J Roentgenol 1919 VI 17
- 12 SKINNER H F Am J Roentgenol 1919 VI 17
- 13 SPILLER W G Med Clin N Am 1921 V 631
- 14 STEWART W H Am J Roentgenol 1913 I and II
33
- 15 TRACHENBERG J K Ann Surg 1923 LXVIII 361
- 16 WHEELER SIR WM The Lancet 1923 CCIV 59

CARCINOMA OF THE SMALL INTESTINE

REPORT OF A CASE OF CARCINOMA OF THE ILEUM

By EDMUND D CLARK, M.D. F.A.C.S. INDIANAPOLIS, INDIANA

THE rarity of carcinoma of the small intestine is well recognized. It is not uncommon for a surgeon of wide experience to pass through his entire career without encountering a case. The report of every case is therefore of interest.

According to Ewing (11), carcinomata of the small intestine comprise 3 per cent of all intestinal carcinomata. Nothnagel's (32) autopsy reports of the Vienna Pathologic Institute for 23 years (1870-1893) and those of Mueller (31) from Basel for 30 years (1874-1904) show that in 53,152 autopsies, 4,494 cases of cancer were found. Of this number 466 were intestinal and 25 were located in the small intestine—13 in the duodenum and 12 in the ileum. Hedlund (16) collected from the literature 658 cases of intestinal cancer, and Lichtenstein (25) 770, making a total of 1,428, of which 39 were in the duodenum and 38 in the remainder of the small intestine. Brill (5), in 1914, estimated that cancer of the intestine, excluding the stomach, forms 2.5 per cent of all cancers found in hospital autopsies. Jefferson (20) estimates 3.1 per cent. Forgue and Chavin (13) in collecting and tabulating the findings in 88,031 autopsies report cancer as occurring 6,847 times, 8 per cent. Of these 642, 9.2 per cent were intestinal, the large intestine being affected 613 times, about 9 per cent and the small intestine in 6 per cent. This is a much larger percentage, however, than is usually recorded. Among Tuttle's (37) 2,432 cases, exclusive of the stomach, in 69 the carcinoma was located in the small intestine, and in 2 in the jejunum. In his report of 2 cases of primary carcinoma of the jejunum Soper (36) records a series of 43 cases of ileocecal cancer collected by Schlieps (35) in 1908. To this list Soper adds 12 cases found omitted from Schlieps' report, making a total of 57 cases. In Schlieps' series the growth was in the duodenum in 19 cases, in the ileum in 22 cases, while in 2 cases it was not definitely located. Hintz (19) in 1912

abstracted the histories of 52 cases of carcinoma of the jejunum and ileum.

Judd (22) writing in 1919, states that in the Mayo Clinic, carcinoma has occurred 24 times in the small intestine as compared with 1,822 times in the large intestine and rectum, and 1,689 times in the stomach. In this series the growth was found five times in the duodenum, eleven times in the jejunum, and six times in the ileum. In two cases the lesions were multiple. In an investigation as to lymph gland involvement in carcinoma of the small intestines, Craig (7) analyzed 36 cases, of these the jejunum contained 46 per cent of the primary growths. Bland Sutton (4) states that the nearer one approaches to the beginning and the ending of the small gut, the more frequently one finds cancer and that such a growth in the mid portion is very rare. This does not correspond with the statement that 46 per cent of carcinomata of the small intestine are found in the jejunum, or with the finding of 11 carcinomata of the jejunum in Judd's series of 24 cases.

Among others who have reported cases of carcinoma of the small intestine during recent years are Johnson (21), who reports 2 cases of carcinoma of the jejunum and 1 of the ileum, Bevan (3), who records 5 cases of cancer of the jejunum, Lichty (26), 6 cases of cancer of the duodenum, McGuire (30), 4 cases, Herman (17) and Portis (33), each 2 cases, Jefferson (20), Deaver (9), Head (15), Baillet (2), Freudenthal (12), Macewen (28), C. B. Davis (8), P. P. Lynch (27), Traylor (38), Vicker (39), Kendall (23), and Primrose (34) one case each.

A review of all the recorded cases shows that primary carcinoma of the duodenum is more common than carcinoma of the jejunum or ileum, and that the jejunum is least frequently the site of malignant growth.

According to Ewing, tumors of the small intestine are of three distinct forms: (1) Part of a local or general intestinal polyposis

This form is rather rare in the small intestine being more frequent in the colon. This type probably explains the occurrence of multiple carcinoma, with perhaps several strictures. (2) Multiple or single embryonal carcinoid tumors which are usually found in the ileum or jejunum in the form of single or multiple firm opaque nodules as large as a pea or bean. They lie in the mucosa or submucosa. In structure they form three groups, according to whether they spring from pancreatic island tissue heterotropic intestinal mucosa or glands. (3) Localized adenocarcinoma which rise under various conditions from single intestinal polyps and tend to maintain an adenocarcinomatous structure. The majority of intestinal carcinomata are of this type. When ulceration is delayed the tumors may reach sufficient size to obstruct the lumen. Metastases are present in one third of the cases and involve the mesentery, liver, lungs and peritoneum. One case of multiple growths has been reported in which there were secondary deposits in the lungs and bones. Craig (7) studied a series of 36 cases of carcinoma of the small intestine in order to determine the incidence of glandular involvement. He found such involvement present in 23 cases, 53 per cent. Each case averaged 1.25 glands.

Johnson (21) recognizes four varieties of primary carcinoma: (1) the stenosing form producing a ring stricture of the gut; (2) the polypoid form in which a rounded mass of growth extends into the lumen; (3) that form in which the growth is attended by extensive ulceration; and (4) colloid carcinoma. Krompecher (24) in his investigation of these intestinal growths found that they bore a marked resemblance to basal cell cancer of the skin. He has written an article entitled "Basal Cell Tumors of the Cylindrical Celled Mucous Membranes with Special Reference to Carcinoids of the Intestines." He says that these tumors consist of small spheroidal cells that they are supposed to have their origin in the basal cells which lie between the cylindrical cells and the crypts of Lieberkuhn and that they are met with in both the small intestine and the appendix. In the intestine they are usually quite small, generally multiple, they resemble small scirrhous cancers, and

not being circular do not cause stenosis. This type of growth is rarely malignant. In most cases of cancer of the small intestines the growth is a cylindrical cell adenocarcinoma. Scirrhous cancer of the small intestine is exceedingly rare. Baillat (2) in 1914 was able to find only 7 cases in the literature.

The average age of patients developing carcinoma of the small intestines has been estimated at 46½ years although a case has been reported by Duncan (10) occurring in a child of 3½ years. Macewen (28) reports a case of adenocarcinoma in a youth of 20. In this case the onset of the illness was very sudden with violent persistent vomiting and great abdominal distention. At laparotomy a tumor the size of a small walnut projected from the side of the ileum and a small perforation was found at the base of the tumor. The tumor had caused ulceration of the bowel wall and had then protruded through the aperture. In this case a second pedunculated tumor was found inside the bowel about 2 inches lower down. Another case of adenocarcinoma of the small intestine in a girl of 19 is described by C. B. Davis (8). In this case an intussusception was found at operation and 8 inches of the ileum and the large gut to the transverse colon were removed. In spite of the finding of large glands in the mesocolon this patient was alive and in good health 3 years after operation.

CARCINOMA OF THE DUODENUM

In the duodenum carcinoma is found most frequently in the middle portion or peripapillary region. The incidence is next largest in the first portion and most uncommon in the jejunal portion. About 70 per cent of all cancers of the duodenum are located in the ampulla. Those located above this area are of particular interest because this portion of the duodenum is so commonly the seat of ulcer, and this suggests the question as to the tendency of these ulcers to undergo malignant degeneration. Judd finds little evidence to show that carcinoma of the duodenum ever arises from an ulcer. Jefferson has collected 30 cases from the literature in which it is possible that the malignant change took place in an ulcer. Mayo (29) found one

case in which the growth seemed to be engrafted on a pre-existing ulcer Shrater, Ewald, Mackenzie Leballo and Letulle (quoted by Forgue and Chavin, 13) have reported similar cases. It may be said, however, that new-growth following a pre-existing ulcer is exceedingly rare. Cancer in the ampullary region of the duodenum is characterized by painless jaundice and great emaciation. In the infra ampullary part of the duodenum, carcinoma usually occurs as a primary constricting lesion. Such cases are often diagnosed as pyloric obstruction, though the clinical features are different in that the patient with duodenal obstruction due to cancer usually vomits a large amount of material containing bile and pancreatic secretion. The tumors are usually small and produce a marked degree of obstruction. If they are not attached posteriorly to the vena cava they may sometimes be removed satisfactorily (Judd). Carcinoma of the third part of the duodenum is suggested when marked dilatation of the duodenum is encountered.

CARCINOMA OF THE JEJUNUM AND ILEUM

In these localities carcinoma occurs either as a degenerative polyp or as a ring carcinoma, like that seen in the large intestine. In the degenerative polyp type, there is usually no evidence of the condition until the tumor has been forced down into the lumen of the bowel, producing intussusception and obstruction. Intussusception is commonest in the polypoid form of growth. These tumors in the jejunum rarely become sufficiently large to interfere with the lumen of the intestine. They may, however, be multiple, as in two of Judd's cases. In the ring type of carcinoma the onset of the obstruction is gradual and often the lesion is located with difficulty. The tumor is small and is not palpable in the early stage of the disease, although peristaltic waves may be in evidence. On exploration the proximal loop of intestine will be found greatly dilated and the wall hypertrophied, due to the gradually increased exertion in carrying on its function. Later the growth often becomes large and involves so much of the intestine that it is often mistaken for tuberculosis. Frequently the lumen of the

gut is not greatly interfered with by the growth so that it may become very extensive before it is recognized. Comparatively few carcinomata occur at the ileocecal valve. Judd states that in his cases, nearly all the growths were several inches above the valve, although a number of cases are reported in the literature in which the growth seemed to arise directly in the mucosa at the juncture of the large and small intestine.

A number of cases of multiple tumors of the small intestine have been recorded, as for example that of Bailey (1), in which one growth the size of an orange was situated 18 inches below the ligament of Trietz, while a second tumor, slightly smaller, was found 4 feet lower down in the intestine. When this occurs, the more distal tumor or tumors are probably implantations from the more proximally located primary tumor. Bunting (6) in 1904, described a case of multiple carcinoma of the small intestine in which the patient died of heart disease without any history of intestinal symptoms whatever. Throughout the length of 50 centimeters of the upper ileum were scattered six firm, opaque, white nodules, 3 to 7 centimeters in diameter, and covered by mucous membrane. This author refers to six other recorded cases of a similar nature, in all of which death resulted from other causes.

SYMPTOMS AND DIAGNOSIS

In the cases reported in the literature an early diagnosis was not made. It was only when symptoms of acute obstruction appeared that operation was undertaken and the nature of the tumor was discovered. Many of the reported cases are necropsy findings. The clinical picture depends, of course, upon the type and the stage of growth. In the early stage there may be no subjective symptoms, in the latter stages the symptoms are those of more or less complete intestinal obstruction. The usual symptoms are loss of weight, anæmia, asthenia and vague abdominal discomfort. Later, as obstruction begins, pain increases. It may be colic-like or paroxysmal, especially when there is much tympanites. At times there is constipation which may become progressively severe, with definite stenosis at the tumor site. Again, there may be

no constipation but instead diarrhoea, or diarrhoea and constipation may alternate. Stomach symptoms soon make their appearance. Vomiting is frequent, possibly eight or ten times daily, the vomitus being greenish in color although in a well developed case it may be brownish and have a fecal odor. The symptoms which are of the greatest diagnostic value are stubborn constipation with or without alternating diarrhoea, severe attacks of colic like pain and vomiting. Objective symptoms are not found early but with increasing obstruction there is tympanitis and visible peristalsis and a tumor may be palpated. The tumor is usually small, firm, movable and changeable in location.

Although hemorrhage is uncommon in the early stages of carcinoma of the small intestine even in the earliest stages some erosion occurs and occult blood may be found in the stools. Gross blood is rarely present. A search for occult blood is therefore a diagnostic measure of great importance and should never be omitted in a case in which other symptoms are at all suggestive of intestinal carcinoma. Laboratory study of the gastric contents does not give any evidence of the disease. The X rays are of great help in diagnosis. The finding of a normal stomach and duodenal bulb will rule out cancer of these structures as a cause of the symptoms or the presence of occult blood in the stools. Usually the roentgenogram will show dilatation of the intestine above the site of the obstruction and it often serves to locate the lesion with a fair degree of accuracy as it did in the author's case. The duration of symptoms varies from a few days to about 6 months in the majority of cases although a few have been reported in which there had been symptoms of many years duration referable to the stomach.

Johnson who reports one case of cancer of the ileum and two cases in which the growth was in the jejunum has made a comparison of the symptoms and points out an interesting difference. In the two cases of jejunal cancer the distention and visible peristalsis were limited to a single coil transversely, in one case above and in the other immediately below the umbilicus. In the case of cancer of the

ileum there was considerable general distention and the "ladder" arrangement was very marked, the peristalsis being seen in four or five transverse coils lying partly above and partly below the umbilicus. The diagnosis in this case was probable pyloric obstruction. For 6 months the pain was chiefly in the umbilical region with occasional vomiting. The attacks usually started shortly after taking food, and vomiting relieved the pain. There was considerable shifting, dullness in the flanks, tenderness above and to the right of the umbilicus and much splashing and gurgling could be felt over the entire abdomen.

TREATMENT

The treatment of carcinoma of the small intestine like that of carcinoma in other portions of the gastro intestinal tract is surgical. If the tumor is not suitable for removal a lateral anastomosis may be performed. Although resection of the bowel with all the associated glands is the operation of choice and produces the best postoperative results yet anastomosis around the lesion results in a high percentage of postoperative longevity (Craig). In the presence of a marked degree of obstruction, surgeons are agreed that immediate resection of the intestine is almost certain to lead to disaster, and that the two stage operation offers the patient the better chance for survival. The artificial anus should be made above the growth a procedure attended with much danger to the patient partly on account of the rapid emaciation likely to occur and partly because of the damaging effect of the bowel contents on the surrounding skin. The second operation should be carried out with as little delay as possible.

PROGNOSIS

From a review of the after history of the majority of cases of carcinoma of the small intestine the outlook for recovery from the disease does not appear promising. Craig found that prognosis was most favorable when the disease is located in the jejunum. In these cases the hospital mortality was least and the percentage of longevity was greatest. There seems to be a high mortality from lesions of the ileum, although a few cases are recorded

in which an uneventful recovery ensued I Heng Liu (18) reports three cases of carcinoma of the small intestine. The first occurred in a man aged 35, in whom an abdominal tumor could be palpated. The patient had suffered from primary anæmia for six months, but never had symptoms of intestinal obstruction. At operation a tumor the size of an orange was found in the ileum, and a large mass of glands of the same size in the mesentery. There was a recurrence later and the patient died. In the second case, a man aged 53, the patient had had chronic intestinal obstruction for several months. The tumor in this case was found in the jejunum. The third patient, aged 68, complained of chronic intestinal obstruction. The roentgenological diagnosis was carcinoma of the colon. At operation a hard mass which proved to be carcinoma was found in the lower portion of the ileum.

AUTHOR'S REPORT

E S, female, aged 59 years, a housekeeper, referred by Dr H M Bunnell of Waynetown, Indiana, admitted to St Vincent's Hospital, Indianapolis, February 27, 1925, complaining of vomiting after meals, pain in the epigastrium, intestinal colic, constipation, and loss of weight and strength. The patient's father died at 80 years of old age, her mother died of apoplexy at the age of 68, one sister died in infancy, another of pulmonary tuberculosis, while the cause of death of a third sister was unknown.

The patient had been a healthy child. She had diphtheria at the age of 4½ years, scarlet fever at 5, and then measles and mumps, recovery from each of these diseases being uneventful. Menstruation began at 12 years and a normal menopause occurred at 44 years. There was nothing abnormal in the menstrual history except for a slight dysmenorrhœa. When 15 years of age the patient fell sustaining an injury to the spine for which she was compelled to wear a brace during a period of 14 years. She was never rugged after this injury. She had an attack of influenza 35 years previously, when she was confined to bed for 7 weeks. Again in 1918 she had an attack of influenza with three relapses. She had complained of stomach symptoms ever since the spinal injury. These symptoms consisted of indigestion, gas, and distress. She could not eat meat or drink milk without suffering from indigestion.

The history of the present illness was taken by Dr A B Graham during the time she was under his observation. In September 1924, the patient began to have severe pain in the epigastrium, intestinal colic, and attacks of vomiting. At times she vomited a greenish fluid from 1 to 3 hours after meals. All

these symptoms had gradually become intensified with occasional few days' relief. The attacks of vomiting occurred at intervals of 2 or 3 days. The patient was constipated, but during the past 3 months had passed occasional normal stools. Lavage and enemata had given marked relief, with the result that she had gone 9 days without vomiting. Lavage secured the contents of the small intestine which had been regurgitated into the stomach. The patient's best weight was 127 pounds at the age of 15, in October 1904, her weight was 103 pounds and at the time of admission was from 85 to 90 pounds.

Physical examination. The abdomen was flaccid and slightly tender to deep palpation over its entire area. The symptoms were those of incomplete obstruction in the lower small intestine.

Roentgenographic examination. The roentgenologist's report stated that the stomach was of the elongated hook type with marked ptosis. It was freely movable and was negative for filling defects. The peristalsis was decreased but the waves passed completely through the stomach. At the end of 5 hours there was retention of one half of the stomach contents. The small intestine showed marked distention, apparently due to an obstruction rather high up in the ileum. At the end of 24 hours, the retention remained the same as at 5 hours. This was attributed to reverse peristalsis. From these findings it was concluded that the stomach was negative and that there was an obstruction in the ileum.

Blood count showed red blood corpuscles 3,560,000, hæmoglobin 80 per cent, leucocytes 5,640, polymorphonuclears 67 per cent, small mononuclears, 26 per cent, large mononuclears 5 per cent, transitionals 1 per cent. The blood Wassermann was negative.

Stomach analysis. The result of four examinations showed hydrochloric acid negative each time, the total acidity shown by these examinations was 16, 26, 28, and 30 respectively. The retention was 130 cubic centimeters. The reaction for mucus was plus 4, there was no blood but a great deal of bile. Digestion was fairly good.

Urinalysis. specific gravity 1,020, urine negative for both albumin and sugar, no casts, many pus cells.

The patient's temperature ranged from 98 degrees to 98.4 degrees F, pulse from 60 to 86, respirations from 18 to 24.

The final pre-operative diagnosis was obstruction of the small intestine, probably in lower ileum.

Immediate surgery was advised as the only method of treatment. Surgery was refused; the patient returned to her home, and the author was not called until complete obstruction occurred. There was moderate distention but the abdomen was not tender. A mass could be palpated in right lower quadrant.

Operation. On opening the abdomen after the usual preparation, we found enormously distended coils of small intestine protruding from the wound. The tumor mass that had been felt before the abdomen was opened was easily found and exposed. It was situated in the ileum about 12 inches from the

ileocecal valve. No enlarged glands were found either by inspection or palpation. A section of bowel about 8 inches in length was resected and side to side anastomosis was made. The abdomen was closed without drainage. Recovery uneventful.

Pathological report. Pathological work was done in the laboratory of the Indiana University School of Medicine. The gross section consists of a section of small bowel about 8 inches long with a triangular portion of the adjacent mesentery. At the center of the loop of intestine there is a mass which is firm on palpation and about the size of a pigeon's egg. On opening the intestine we see a fungating mass almost occluding the lumen of the gut. The surface is ulcerated exposing a colloidal material.

Microscopic examination. The section is so cut that the longitudinal muscle of the gut is seen in cross section. The mucosa shows marked degeneration and the nuclei of its deeper parts fail to take the stain probably because of faulty fixation. The mucosa abruptly becomes discontinuous and is replaced by a highly infiltrated and edematous inflammatory tissue in which are patches of abnormal columnar epithelium arranged in the form of grotesquely irregular glands. Many of these aberrant cells are distended with mucus producing signet ring forms. This neoplastic tissue penetrates the gut wall to the serous surface interrupting and infiltrating the muscularis. In the deep layers of the wall the tissue elements are widely separated by pale staining material presumably mucus. In this situation the epithelium shows but little tendency to form glands. The cells occur in solid masses occasionally assuming a squamous arrangement.

Diagnosis. colloid carcinoma of the small bowel.

Leichtenstein (25) in 1888 in reviewing a series of 780 intestinal carcinomata discovered 16 cases of primary carcinoma of the ileum. In 1904 Bunting reported but one case of carcinoma of the ileum in 2 200 autopsies at the Johns Hopkins Hospital and up to 1911 in over 2 500 autopsies at the Royal Victoria Hospital Montreal only 2 cases of this nature were found. In the recent literature the two largest series of cases of carcinoma of the ileum are those of Craig who in his series of 36 cases of carcinoma of the small intestine found the lesion in the ileum 8 times. In the series of 24 cases reported by Judd the lesion was found in the ileum 6 times.

According to Bunting the histological nature of the tumor seems to be constant in all the cases described. (1) There is the occurrence of groups of cells (supported by an abundant stroma in the submucosa) having an appearance very similar to the usual type of basal cell carcinoma. (2) There is continuity

of some of the tumor acini with the glands of the mucosa. (3) Discrete foci occur each one presenting identical features. Bunting's case showed local eosinophilia but no blood changes. These tumors arise from the mucosal glands, and there is an absence of any obvious irritative origin. The origin is not in the cell rests. The process consists in spontaneous gradual proliferation of the fundi of the small glands in small areas of mucous membrane without any tendency to metastasis until a late period of development. The process is similar to what occurs in appendix tumors. In the case described by Granner and Fraser (14) the ileum showed uniform enlargement of the solitary follicles with little or no congestion. About 15 meters above the ileocecal valve a small nodule occurred 1 by 1 centimeter and projected into the lumen. Thirty centimeters above this was a smaller nodule of similar nature, and still another nodule was found at about the middle of the ileum. No metastases were found in these cases. In Craig's series of 8 cases 5 showed no glandular involvement. Resection was performed in 7 of Craig's cases. Four of these patients succumbed in less than a week after operation one lived 90 days and one was alive and well 14 years after the removal of the primary growth. Bassler reports an interesting case of carcinoma of the ileum in which the symptoms were of 18 months' duration. The patient had had typhoid fever some years before and the question is raised whether the carcinoma formed on a cicatrix remaining after the perforation of a typhoid ulcer. In this case the first symptom was vomiting fecal in type. The peristalsis was most marked, it could be traced from the ileum up and terminated in involvement of the entire stomach. The tumor was found within 2 feet of the cæcum and was 2 inches in length and 1 inch in diameter. The ileum about 2 feet above the growth was united by lateral anastomosis to the ascending colon. This patient made an uneventful recovery.

In Judd's cases of carcinoma of the ileum the symptoms were of short duration being present from 1 to 21 months. In one case there had been indefinite intestinal symptoms for 10 years and in this instance the lesion

formed on a degenerating polyp of the ileum. In another case there was a history of diarrhoea for 2 years. The principal lesion was a carcinoma of the cæcum, and the tumor in the ileum was not responsible for the symptoms. Recently Alexander Primrose (34) has reported a case of carcinoma of the ileum which is of interest not only because of the rarity of the condition, but because of the advanced age (80 years) of the patient. In spite of the patient's age the symptoms were so urgent that operation was imperative. A constriction of the ileum was found 8 inches proximal to the ileocecal junction. There was no glandular involvement. The patient made a good recovery and was in good health 2 years after the operation. The growth in this case was an embryoma. No mitotic figures were present.

In the author's case, as in all others reported in the literature, the pre operative diagnosis was intestinal obstruction. The patient had suffered from indigestion for many years but a definite increase in the intensity of the stomach symptoms was noted about 6 months before symptoms of obstruction manifested themselves. In Craig's cases the duration of symptoms ranged from $1\frac{1}{4}$ to 6 months. In view of the poor prognosis given for carcinoma of the small intestine, the outcome in this case was rather unusual. A point of particular interest is the information supplied by the roentgenological examination, which not only confirmed the diagnosis of intestinal obstruction, but located the lesion definitely before operation.

CONCLUSIONS

1. Carcinoma of the small intestine is a rare condition. It occurs more frequently at the upper and lower ends of the small intestine than in the intervening portion.

2. The symptoms of carcinoma of the small intestine are those of intestinal obstruction. In no reported case has the diagnosis been made before operation.

3. When there are indefinite symptoms that might be suggestive of partial intestinal obstruction, examination of the stools should be made for occult blood.

4. The X ray gives valuable assistance in the diagnosis of intestinal stenosis and in locating the lesion.

5. The finding of a colloid carcinoma in the author's case is of interest, as this is the rarest type of carcinoma found in the small intestine.

BIBLIOGRAPHY

1. BAILEY F W. Multiple primary carcinomata of the jejunum. *J. Missouri State M. Ass.* 1917 ix 53.
2. BAILLAT Arch. de l'app. digestif 1914 xiv 18.
3. BEVAN A D. Carcinoma of the jejunum etc. *Surg. Clin. Chicago* 1917 i 471.
4. BLAND SUTTON SR J B. On cancer of the duodenum and small intestine. *Lancet* London 1914 ii 931.
5. BRILL Am. J. M. Sc. 1914 cliv 824.
6. BUNTING C H. Carcinoma of the ileum. *Bull. Johns Hopkins Hosp.* 1904 xv 387.
7. CRAIG M. Mck. Lymph glands in carcinoma of the small intestines etc. *Surg. Gynec. & Obst.* 1924 xxviii 479.
8. DAVIS C B. Adenocarcinoma in girl of 19 with extensive gland involvement. *S. Clin. N. America* 10 4 August.
9. DEAYER J B and RAUDIN. *Am. J. M. Sc.* 1920 clx 469.
10. DUNCAN. Quoted by Traylor.
11. Ewing J. Neoplastic Diseases. Philadelphia W. B. Saunders and Company 1922.
12. FREUDENTHAL P. Carcinoma of the small intestine. *Hospitalstid.* 1921 lvi 785.
13. FORGUE and CHAVIN. *Rev. de chir.* 1915 xlv 470.
14. GRANNER O C and FRASER J R. *J. Path. and Bact.* 1912-13 xvii 163.
15. HEAD G D. *Am. J. M. Sc.* 1919 clviii 182.
16. HEDLUND J A. *Allmann. Svensk. Lakartid.* Stockholm 1916 xiii 317.
17. HERMAN N B and von GLAHN C W. *Am. J. M. Sc.* 1921 clxi 111.
18. I. HIENG LIU. *Arch. Surg.* 1915 v 602.
19. HINTZ R. *Arch. f. Klin. Chir.* 1911 p 305.
20. JEFFERSON. *Brit. J. Surg.* 1916 October.
21. JOHNSON R. *Brit. J. Surg.* 1917 ix 422.
22. JUDD E S J. *Lancet*, 1919 xxxix 159.
23. KENDALL G M. *Brit. J. Surg.* 1925 vii 617.
24. KROEPFCHER. *Ziegler's Beitr. z. path. Anat.* 1919 xlv 79.
25. LICHTENSTEIN. *Ziemssen's Handbuch* 1888 vii 523.
26. LICHTY J A. Peptic ulcer and carcinoma in the duodenum. *New York State J. M.* 1918 xviii 433.
27. LYNCH P P. Cancer of the jejunum. *J. Path. & Bact.* 1925 xxviii 394.
28. NACEWEN J A C. Adenocarcinoma of the small intestine in youth of 20. *Lancet* 1921 i 693.
29. MAYO J. *Am. M. Ass.* 1921 October 19.
30. MCCUIRE E R. *Arch. de mal. d'appar. dig.* 1920 x 419.
31. MUELLER FRITZ. Inaugural dissertation, Basel 1903.
32. NÖTHVAGEL. *Die Erkrank. des Darms* Vienna 1898.
33. PORTIS M M and PORTIS S A. Carcinoma of the small bowel. *Am. J. Roentgenol.* 1923 x 419.
34. PRIMROSE ALEXANDER. Primary carcinoma of the small intestine. *Ann. Surg.* 1925 lxxxi 49.
35. SCHLEEPS W. *Beitr. z. Klin. Chir.* 1908 lvi 3.
36. SOPER. *Boston M. & S. J.* 1900 July 22.
37. TUTTLE. Quoted by Bailey F W.
38. TRAYLOR G A. *J. M. Ass. Georgia* 1924 xiii 436.
39. VICKER D M. *Ann. Surg.* 1924 lxxix 239.

ANEURISM OF THE SUBCLAVIAN ARTERY LIGATION OF FIRST DIVISION AND INTRASACULAR SUTURE¹

By WALTER C. C. KIRCHNER, A.B. M.D. F.A.C.S. St. Louis, Missouri

Assistant Surgeon City Hospital

ANEURISM of the subclavian artery presents special surgical problems in its treatment. With few exceptions this condition proves fatal when it is left untreated as rupture takes place either externally or into the pleura trachea or bronchus. As the aneurismal sac enlarges it encroaches upon important structures, pressure symptoms manifest themselves, considerable pain is present either at the site of the tumor or referred to more distant parts of the limb, neck or shoulder, and the resulting necrosis may involve not only the soft structure but also the clavicle. There is an alternation in the circulation of the affected limb which usually becomes atrophied and the function and usefulness of the extremity is impaired.

In a review of the subject Matas refers to Souham's statistics in which in 115 cases studied 81 were of idiopathic and 31 of traumatic origin. Aneurisms of the first and second divisions are less frequent than those of the third division. Of 551 cases of aneurisms in general about 4 per cent were of the subclavian type. Non-operative measures have as a rule failed to effect a cure. Of a number of different operative procedures that of ligation and treatment of the aneurismal sac has given the best results.

The older surgeons considered ligation of the subclavian artery, especially on the left side, an impracticable procedure. Sherrill, who studied the matter of ligation of the subclavian artery in 1910, found that the ligation of the artery anteriorly in its first division on the left side had been successfully accomplished by Halstead, Schuempert and Juengst, and quotes Halstead as stating that the right subclavian in its first division had been ligated twelve or more times and that each case resulted fatally.

According to J. H. Armsby the first division of the subclavian artery has been ligated thirteen times with one recovery. From a review of the cases that have been reported it becomes evident that ligation of the first portion of the left subclavian for aneurism is a serious and difficult procedure, although the results in recent years when modern aseptic methods of operating have been employed have shown considerable improvement.

In aneurisms of the subclavian artery that are large and encroach upon important structures of

the neck, the method of surgical attack offers a difficult problem and in those cases in which ligation of the first part is to be done the surgeon must decide whether this shall be attempted anteriorly or posteriorly through the chest wall. A method of posterior attack was described in 1910 by Sherrill who performed the operation by making an incision about 4 inches long along the posterior margin of the scapula, joining this by an incision directed inward from the inferior extremity to the spinous process and another similar incision placed at the upper part of the first incision. Within this area the soft tissues were dissected from the ribs and the second, third and fourth ribs were removed for a distance of about 3 inches. By liberating the pleura and pushing it gently downward and outward, the subclavian artery was made accessible and ligation was made possible. A somewhat similar operation for ligating the first part of the left subclavian from behind has been more recently described by A. K. Henry. In approaching the subclavian artery for ligating the first portion from the front, several operators have found it necessary to resect the clavicle. However, a simpler procedure, based on anatomical landmarks is perfectly feasible.

For concrete consideration of the subject of aneurism of the left subclavian artery it may serve our purpose to narrate briefly the following case which came to me for operation.

The patient, W. J., a colored man, 39 years of age, referred to me by Dr. L. Gros, stated that in 1913 while living in Russellville, Kentucky, he was shot through the left shoulder, the bullet entering the upper and mid portion of the clavicle and after taking a direction inward and downward through the neck, lodged under the skin to the right of the spine and on a level with the first dorsal vertebra. The bullet was promptly and easily removed by the doctor who first saw him. While the wounds healed readily, he could not in the beginning use the hand of the affected side, though later on the usefulness of the left hand and arm returned. Shortly after the injury a small pulsating tumor, which was scarcely visible, developed above and adjacent to the clavicle at the middle portion. In the same year he went to a hospital in St. Louis where an operation was to be performed, but on being informed of the danger of the operation he decided not to be operated upon. For 10 years the tumor remained about the same size and he was able to continue with his work as a furniture mover until one day while carrying a heavy load on his shoulder he had a sudden pain in the region of the tumor. The tumor then grew steadily larger and began to

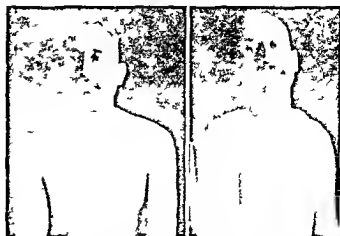
encroach on the side of the neck. He lost the use of his arm and suffered pain not only in the shoulder but also in the hand and especially in the thumb and first finger. It was on account of the pain and gradual enlargement of the tumor that the patient finally sought surgical relief.

In eliciting the history of the case nothing of interest was brought out that had a special bearing on the patient's present condition. He was usually healthy as a child and in later years had never been sick. He denied having had any venereal diseases. He used to drink beer and whiskey daily but seldom got drunk. He was of normal weight and stature. His appetite was good and he had slept well except for the pain in the shoulder and arm. The functions of the bladder and bowels were good. The heart and lungs were normal. His right arm had been broken but complete usefulness had been regained. He had never been operated upon.

Relative to his present condition the following observations were recorded. In the supraclavicular region behind the middle third of the clavicle there was an expansile and pulsating tumor dome like in appearance which measured 3.5 inches across and 4.5 inches in its longest diameter (illustration). The tumor was in contact with the clavicle and also extended inward as far as the neck. The usual characteristics of an aneurism were elicited. A roentgenogram of the left shoulder girdle showed a large subclavian aneurism with marked calcification of the subclavian artery. The blood pressure was 150-100 and was the same for both the right and left arm. The pulse rate was 97 per minute. Comparative measurements showed definitely atrophy of the left arm. Sensation was present everywhere over the skin of the left arm forearm and hand. The movements of the left arm and hand were slightly restricted and compared with the right the skin was of a paler color. Pressure symptoms of the tumor were present and there was pain in the region of the mass and the affected extremity. It was on account of the pain that the patient sought surgical relief.

Operation. The operation was performed under general anesthesia preceded by the administration of morphine sulphate $\frac{1}{4}$ grain and atropine sulphate $\frac{1}{150}$ grain. A skin incision about 3 inches long was made along the outer and lower border of the sternomastoid muscle and from the lower end another incision was made in an upward direction parallel to the clavicle and over the tumor. A triangular flap of skin with the platysma was dissected free after ligation of the external jugular to expose the underlying structures.

The outer border of the sternomastoid was made free by dissection along the fascial planes and by inward retraction of the muscle the jugular vein, the carotid artery and the pneumogastric nerve were exposed. The digastric muscle which crosses these structures was severed. In this location it was found that the aneurismal sac extended toward the carotid and by contact seemed to be a part of this artery. The internal jugular vein was traced to the subclavian vein and the thoracic duct was defined. In order to expose the scalenus anticus it was necessary to free by dissection a number of glands and a part of the sac of the aneurism. The phrenic nerve was seen as it lay flat upon this muscle. With the anterior border of the scalenus anticus as a guide by finger dissection the entire border was exposed as far as the first rib. Behind the muscle was felt the pulsation of the aneurism but the normal subclavian artery was not defined. The finger passing along the insertion of the scalenus anticus the dissection was continued beneath the first rib and along the left side of the bodies of the vertebrae. The arching portion of the subclavian artery lay deep as far as the tip of the index finger could reach but was readily then laid bare by deep retrac-



Front and side views of patient

tion and blunt dissection. The pleura was not so readily defined and the resembling fascial structure might there for easily be injured.

With the use of deep narrow retractors the subclavian artery was seen lying deep at the bottom of the space. The sheath of the artery was separated and with an aneurism needle a double strand of No. 2 chromic catgut was placed at the first portion of the subclavian artery and the vessel was ligated. Pulsation in the aneurismal sac ceased at once. There was no accident or complication in performing the ligation. On account of the depth and limited space an aneurism needle with the arm making an obtuse angle with the shaft is to be preferred in passing the ligature. Ligation of the artery was so readily performed that obliteration of the aneurismal sac was next attempted. The structures overlying the most prominent part of the sac were made free and as had been done in numerous other instances the sac was freely incised and so to 60 cubic centimeters of soft light brown and friable clot was removed. The outer covering of the sac was fibrous in character while the inner coating peeled off easily was soft thin smooth bluish and on the inner side resembled intima. In spite of the ligation hemorrhage from within the sac was quite profuse and came from the region of the internal mammary artery, the vertebral and thyroid axis. The sac had several chambers or pockets one under and behind the mid portion of the clavicle which formed the wall of this portion of the sac. Another pocket was in the region of the internal mammary artery and a third projection extended behind the scalenus anticus muscle. The inner part of the wall showed calcareous deposits behind the intima. There was no bleeding from the distal part of the sac. The bleeding vessels leading to the sac could not be clamped off and hemorrhage had to be controlled by compression. With difficulty suture was placed and bleeding from the internal mammary artery was controlled by ligation. The brachial plexus could not be defined and the area was involved in dense cicatricial tissue. Sutures were placed to control hemorrhage from the vertebral artery and thyroid axis but owing to the pocket formation ligation *en masse* had here to be employed as we realized the possibility of encroaching on the nerves of the brachial plexus. It was a great relief when all hemorrhage was controlled. The globular portion of the sac was obliterated by imbrication of the margins as recommended by Matas and the resulting mass was about 3 centimeters in diameter. The cut skin margins were approximated with silkworm gut sutures. Though the operation was long and tedious the patient stood the operation fairly well and reacted shortly

after being placed in bed. Though the pulse was absent there seemed to be evidence of a sluggish circulation and the entire extremity was placed in cotton and kept warm.

The postoperative course as to the patient's general condition was uneventful. There was impairment of the extensor muscles of the forearm resulting in wrist drop though sensation everywhere was complete. On the third and sixth day a quantity of sero sanguinous fluid was liberated from the wound in the neck. Good wound healing without infection ultimately resulted.

The patient had not been seen for nearly 2 years. He had not used the arm much and there was considerable muscular atrophy. The wrist drop had improved slightly. With massage and properly directed exercise a fairly satisfactory result may yet be obtained. The aneurism has remained completely cured. The radial pulse cannot be felt and the blood pressure on the affected side could not be recorded.

In determining upon a method of surgical attack in aneurisms of the subclavian artery several methods present themselves for consideration. Ligations may be performed as conservative measures. Ligating the artery distal to the sac has not given good results. Ligations proximal to the sac have in a few instances brought about a cure but mostly the simple ligations of the subclavian artery alone have resulted in recurrences. The gradual obliteration by the use of Halsted's aluminum bands is of service especially if there is any doubt as to the circulation in the extremity.

A study of the efficiency of the collateral circulation is always important and tests should be made to determine this. The hyperemia reaction or color test, the preliminary occlusion of the main vessel by the use of removable bands, oscillometric manometry and clinical observation tests in spite of the absence of the pulse are of value but may be difficult of demonstration in subclavian aneurism. When an aneurism develops gradually there is a tendency for the collateral circulation to adjust itself just as in the gradual obliteration by the use of bands.

It may be remarked that in pathological aneurisms of the subclavian artery gangrene of the extremity rarely occurs and this may be explained by the efficiency of the collateral circulation about the shoulder girdle. If there seems to be any doubt as to the circulation and if time and shock are factors a two stage operation may be resorted to. We must consider the surgical risk as to the life of the patient and also the risk as to the affected limb. The age and resistance of the patient, the size and location of the tumor and its relation to important structures, the efficiency of the collateral circulation and the possibility of improvement by compression of the main vessel, massage and therapeutic measures are all important factors for consideration.

The radical procedures resolve themselves into

aneurismotomy, aneurismectomy and endo-aneurismorrhaphy. Some operators have obtained good results by complete excision of the aneurism. The simpler endo-aneurismorrhaphy I believe is to be preferred since this operation is more conservative. The restorative and reconstructive operations are of little value and therefore the obliterative type of operation is to be preferred. When the aneurismal sac is pouched and ramifying as in my case, intrasaccular suture is very difficult and if possible the tributary vessels should be made free so that ligation may be performed if required. It seems easier and best therefore to expose these vessels before opening the sac since otherwise the dissection may be impossible. The case here presented illustrates the necessity of having all of the vessels associated with the sac under control. If there is any doubt as to the collateral circulation, the occlusion of the main artery by the application of the aluminum band or ligature should first be tried. Whether a one or two stage operation is to be performed depends upon the various factors that are associated with the condition. The simpler procedure the more ideal is the operation in this type of cases and one can safely concur with Mitas that endo-aneurismorrhaphy is the operation of choice.

REFERENCES

1. CILDEWELL C. T. Traumatic aneurism of the axillary artery ligation of the subclavian recovery. *Tr South Surg Ass* 1916 xxix 86.
2. HALSTED W. S. Stinking elevation of temperature of hand and forearm following excision of subclavian aneurism and ligations of left subclavian and axillary arteries. *Bull Johns Hopkins Hosp* p 1910 July 31 No 353.
3. Idem. On the use of aluminum bands. *J Exper Med* 1909 March 1.
4. Idem. *Bull Johns Hopkins Hosp* 1902 iii 93.
5. HAUGOLD H. A. Ligation of subclavian artery at first portion for aneurism. *Med Rec* 1916 March 25.
6. HENRY ARNOLD K. A method of ligaturing the first stage of the left subclavian artery from behind. *Brit J Surg* 1923 i 367.
7. JUENST Beitr z klin Chir. Tuebingen 1902 xxiv 307.
8. LAGOUTTE M. and LAPOINTE A. Aneurism of the subclavian and axillary arteries extirpation cure. *Bull Soc. de chir. Par* 1921 xliii 1243.
9. MATAS R. Keen's Surgery v 327 vu 772. Endo-aneurismorrhaphy. *Surg Gynec & Obst* 1925 xli 701.
10. NOON CHARLES. An arteriovenous aneurism treated by ligation of the left subclavian artery. *Brit M J* 1922 May 6 p 714.
11. PARHAM F. W. Ligation of the subclavian artery. *Tr South Surg Ass* 1905 p 292.
12. SHERRILL J. G. Report of a case of aneurism with a new method of ligature of the left subclavian. *Tr South Surg Ass* 1910 xxiii 190.

HERNIA OF THE SUPERIOR EPIGASTRIC ARTERY

By JOHN H MORRIS A B M D NEW YORK

THE case of hernia being reported, although of minor significance clinically, presents such an interesting group of features relating to causation and pathology as to render its detailed consideration both profitable and justifiable

A robust young male laborer was working on a scaffold ing plastering a ceiling above his head when he suddenly felt an acute pain across his left lower chest and soon there after observed a small lump just beneath the costal margin on the left side Ten days later when he presented himself for treatment the tumor had not varied in size but the local pain had become so severe as to induce him to seek medical advice

Examination disclosed an unusually robust young male who appeared to be in excellent general physical condition Just below the costal margin about 4 inches to the left of the midline a hickory nut sized tumor could be seen pulsating beneath the skin To palpation it was firm tender apparently just beneath the skin and its pulsation was definitely expansile

Operation was advised under diagnosis of traumatic aneurism and under local anesthesia the skin was incised exposing the tumor just beneath it The mass was then revealed as a tortuous loop of pulsating artery resting upon the ventral surface of the anterior rectus sheath The pedicle of the tumor was formed by the afferent and efferent limbs of the artery which penetrated a perfectly circular smooth margined fenestrum in the anterior rectus sheath Followed through the muscle, these afferent and efferent branches of the pedicle were seen to be continuous upward and downward respectively with the superior epigastric artery in its normal position between the muscle and its posterior sheath Operation was concluded by excision of the redundant portion of the vessel forming the tumor ligation of the cut ends and closure of the rectus sheath

As far as can be determined, the literature contains no similar type of case, and there is no precedent for classification of this condition as a hernia of the artery However, definition of the term hernia and its application to conditions here existing appear to make such classification permissible

Hernia is defined as the protrusion of an organ or part of an organ or other structure through the wall of the cavity normally containing it and therefore involves the conception of the organ removed from its normal environment but at the same time maintaining by direct continuity of its own tissue some connection with that environment Ectopia, on the other hand while it carries the displacement concept eliminates that of protrusion or continuity with its original locality It is, therefore, evident that the position and relations of the artery and tumor in this case ful

fill those conditions demanded of a hernia within the full meaning of the term, and it is therefore so designated

ANATOMY

The internal mammary artery runs downward from its origin upon the pleura and the transversus thoracis muscle maintaining a position approximately parallel to the lateral sternal margin and behind the first to the seventh costal cartilages In the region of the sixth intercostal space, it divides into two main terminal branches, the musculophrenic and the superior epigastric

The musculophrenic extends downward and laterally over the origin of the pars costalis of the diaphragm, gives off rami intercostales for the seventh to tenth intercostal spaces and terminates as a group of end vessels supplying the diaphragm and abdominal muscles

The superior epigastric artery passes at once between the processus xiphoideus and the seventh costal cartilage and, according to most textbooks of anatomy runs downward on the posterior rectus sheath in relation to the posterior surface of the muscle to anastomose with the deep or inferior epigastric artery below The deep epigastric artery is usually regarded as the main source of blood supply to the muscle and in this capacity is commonly represented as of greater calibre for the conveyance of the larger blood volume while the musculophrenic and the superior epigastric are supposed to bear a rather subsidiary function in this respect

There are, however, certain variants from this

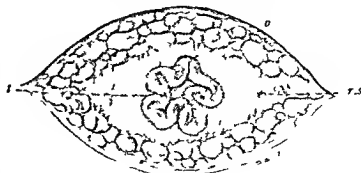


Fig 1 o Margin of orifice r s Anterior rectus sheath T Tumor

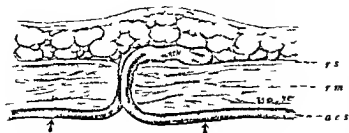


Fig 2 *rs* Anterior rectus sheath *rm* Pectus muscle *aes* Superior epigastric artery

picture which though insignificant anatomically do appear to have an etiological relation to the conditions found in this case.

From a study of a number of dissections of the region it becomes apparent that while the inferior epigastric artery is usually the main artery of supply for the rectus muscle and while it develops a disproportionate calibre and blood volume at the expense of its fellow, the superior epigastric which dwindles to insignificance, these relations are not infrequently reversed. In short there is a definite reciprocal relation existing between these two arteries of supply for in a certain number of cases the superior artery assumes the leading rôle, takes on a large calibre, becomes tortuous and carries the main supply to the muscle.

Under these latter circumstances a further departure from the conventional picture may be noted when the enlarged superior artery instead of confining itself to the space between the posterior sheath and the muscle begins to insinuate itself between the fibers of the muscle and eventually approaches its anterior face. This may be conceived as an expression of the failure of the enlarged vessel to accommodate itself to its confined space and unable to impress the dense fascia posteriorly, it seeks the lines of least resistance and attacks the less formidable muscle. The failure of the inferior artery to behave in a similar manner under like circumstances may be ascribed to the variation in the posterior relations of the two vessels, the superior resting upon the dense rectus sheath above while the inferior trunk during a portion of its course resting upon the comparatively unimportant transversalis fascia.

In seeking to establish the mechanism operating in the causation of this curious condition certain possibilities suggest themselves. One may recall that the patient, at the time of the onset of

symptoms, was working in a strained position applying plaster to the ceiling above his head. It is assumed that his head was thrown back the better to see the details of his work above and to compensate for the consequent shift of the center of gravity of the body the knees were held slightly flexed and the body balanced on the toes. In this posture the body assumes the form of an arc or segment of a large circle its ventral

aspect becoming the convex and its dorsal aspect the concave surface of the arc. Simple principles may now be applied to suggest the subsequent course of events. In this instance the artery judged from its size and volume, appears to have been the main source of supply to the muscle. The patient during the course of his type of occupation doubtless frequently assumed the posture described as a result of which the enlarged superior artery supported on these occasions an increased blood pressure induced by muscular effort and strain. In response to the centrifugal force acting upon it outward and away from the center of the circle of which the body is an arc the pulsating artery under increased pressure, migrates along the lines of least resistance i. e. through the less resistant muscle and soon comes to lie beneath the anterior sheath of the rectus. Here again an increased resistance is encountered but the same forces operating the vessel gradually erodes its way through the anterior sheath of fascia and the last obstacle removed suddenly bursts forth on the ventral surface of the sheath accompanied by the sensation of pain and tumor formation.

The erosive power of arterial vessels is well known in association with the action of aneurism upon confining bony structures and in this case the smooth punched out character in the fascial fenestrum is suggestive of the slowly progressive nature of the process.

Hernia of the superior epigastric artery as illustrated in this case must be ascribed to such anatomical factors as large, tortuous artery, dense posterior wall and vulnerable anterior muscular wall together with certain physical and mechanical forces which are induced by posture and transient blood pressure elevation incident to physical strain.

CLINICAL SURGERY

FROM THE MAYO CLINIC

SUPRAPUBIC PROSTATECTOMY FOR BENIGN PROSTATIC HYPERTROPHY

A CONSIDERATION OF PRE OPERATIVE AND POSTOPERATIVE MANAGEMENT

By VERNE C. HUNT, M.D., F.A.C.S., ROCHESTER, MINNESOTA

SINCE about 1890 much has been contributed with regard to the surgical treatment of the prostate gland, numerous methods having been advocated for its surgical removal, and in recent years as the result of investigation of the effect of urinary obstruction, methods of pre operative preparation have been elaborated. Surgery of the prostate has thus been placed on a par with general surgery.

The phenolsulphonephthalein test of Rowntree and Geraghty and the estimation of the urea content of the blood have proved invaluable aids in the determination of renal efficiency, as well as reliable guides in deciding the time at which operation may be undertaken with relative safety. They serve also as a means of relative prognosis.

Death following prostatectomy has been due to the following causes in order of frequency: (1) co existing or pre existing cardiovascular renal and pulmonary disease, (2) surgical accidents (hemorrhage), and (3) postoperative complications. In recent years effort has been directed toward providing factors of safety in cases of surgical prostatic obstruction, which tend to eliminate causes of death. As a result the mortality rate is less than 3 per cent.

TREATMENT PRELIMINARY TO OPERATION

Two types of cases present the greatest hazards in prostatectomy: (1) that in which prolonged urinary retention has resulted in marked renal insufficiency, and acute uræmia and death are readily precipitated by immediate prostatectomy, and (2) that in which the urinary tract is aseptic and there is retention of but a few ounces of urine as the result of prostatic obstruction, with little impairment of renal function and general sepsis likely to be precipitated by immediate prostatectomy.

Experience has taught that the first type of patient may recover from the actual or potential uræmia; that renal efficiency may be restored or approach normal, and that the cardiovascular renal reserve may be increased by a period of careful and adequate pre operative treatment. The second type of patient may likewise be provided with immunity to infection by the same means.

Recent investigation of the relationship of preliminary treatment to mortality rate following prostatectomy has definitely established the necessity of preliminary treatment in all cases. The important factor in preliminary treatment is drainage of the bladder. Bugbee and others have directed attention to the dangers attendant on sudden emptying of an acutely or chronically distended bladder; these dangers are lessened by the method of gradual decompression, as described by Van Zwaluwenburg, which is applicable to all cases. In the small percentage of cases in which urethral catheterization cannot be carried out, the method can be applied following suprapubic cystostomy. The benefits of preliminary treatment are best attained by continuous drainage by urethral or suprapubic catheter rather than by intermittent catheterization. During the period of drainage the bladder may be irrigated to combat co existing cystitis. Drainage allows recovery of renal function and stabilization of the cardiovascular renal reserve. The length of time that preliminary treatment is necessary depends on the general condition of the patient; such treatment should be continued until the tests of renal function have become stabilized within normal limits. Only under unusual circumstances should prostatectomy be contemplated when the phenolsulphonephthalein return is less than 20 per cent or the urea content of the blood more than 50 milli

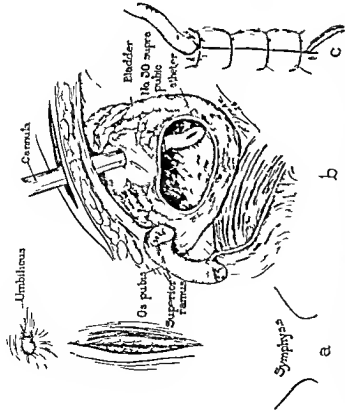


Fig 1 Cystostomy preliminary to prostatectomy (two stage operation) a In cision in the upper half of the median line between the umbilicus and symphysis allows downward extension of the incision for the subsequent prostatectomy with little danger of opening the peritoneum b the trocar has been thrust into the bladder for introduction of the catheter h₂h in the dome after deflection of the peritoneum and preperitoneal fat c the catheter has been brought out at the upper angle of the incision thus facilitating extension of the incision downward rather than upward for the subsequent prostatectomy

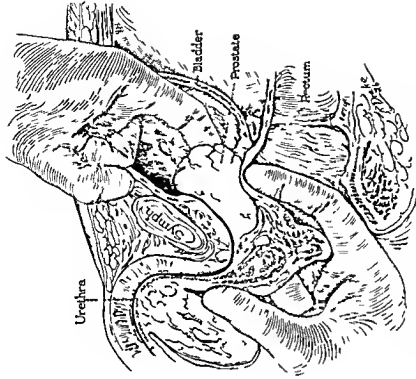


Fig 2 Manual prostatectomy following previous cystostomy The index finger of the right hand in the anus elevates the gland for digital enucleation with the index finger of the left hand Thus it occurs only in the two stage operation and facilitates the procedure in lieu of exposure

grams for each 100 cubic centimeters. In many instances a period of from 10 days to 3 weeks of preliminary treatment assures the relative safety of prostatectomy, however, if renal insufficiency is marked and the patient is in poor general condition, it is necessary to drain the bladder for months before prostatectomy may be undertaken with any degree of safety. Experience has led to the adoption of the minimum of 10 days even in the most favorable cases.

Usually suprapubic prostatectomy is performed in one stage. However, associated lesions of the bladder such as vesical calculi (12 per cent) diverticula (5 to 7 per cent), severe cystitis and marked renal insufficiency requiring prolonged drainage, and senility forbid the uniform adoption of the one stage operation. Nevertheless, in carefully selected cases drainage of the bladder may be adequately carried out by urethral catheter, thus facilitating in 75 per cent of the cases the one stage visible operation which permits the application of the general principles of surgery, that is, exposure, accuracy of conduct and complete hemostasis.

The effect of drainage of the bladder is enhanced in the presence of co existing vesical lesions if vesical calculi are removed at preliminary cystostomy and diverticula excised extravasically or transvesically after the method of the late Dr Geraghty. If in the absence of calculi or diverticula, cystostomy must be performed as a means of drainage preliminary to prostatectomy on account of an impassable urethra, the necessity of prolonged drainage, senility, and so forth, it is best accomplished under local anæsthesia in the most simple manner, through a small low median incision the peritoneum being retracted and the dome of the bladder exposed before a trocar is thrust in for the introduction of the catheter (Fig 1).

The occasional low reflection of the peritoneum anterior to the bladder, even when the bladder is greatly distended, presents a hazard to the trocar method, except when the instrument is introduced after the wall of the bladder has been exposed. Preliminary cystostomy for drainage only and not for the removal of calculi and diverticula is most readily accomplished by distention of the bladder with water or an irrigating solution. It is important in the performance of preliminary cystostomy that the trocar be introduced high into the bladder and the catheter brought out at the upper angle of the wound rather than at the lower, or just above the pubes (Fig 1 band c). This allows enlargement of the incision downward at subsequent prostatectomy and obviates

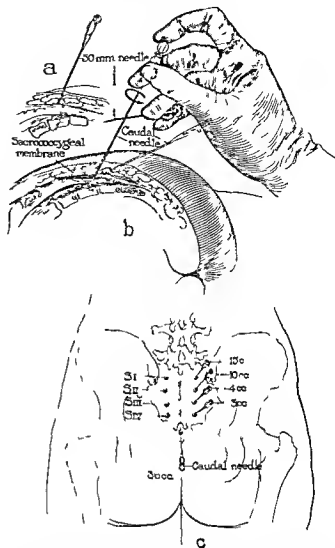


Fig 3 Sacral nerve block. The injection consists of 100 cubic centimeters of 1 per cent procain solution at body temperature with 6 minims of 1:2000 epinephrin solution (1 cubic centimeter ampule 1:2000). Patient in the prone position, pillow beneath pelvis. Anæsthesia induced in 15 minutes after injection and lasts for an hour or more. a A 50 millimeter needle is inserted through a wheal and the sacrococcygeal membrane into the tip of caudal canal and 5 cubic centimeters of solution injected to make painless the insertion of the caudal needle. b The 50 millimeter needle is withdrawn and the caudal needle inserted in its stead and advanced into the caudal canal after being rotated so that the bevel rests on bone. c dorsal view of sacrum with caudal needle in position as well as those in S I II III and IV (that is the first second third and fourth sacral foramina). A total of 36 cubic centimeters of solution is placed in the caudal canal in the average case. The average amount of solution for each foramen on each side is shown. The sacral nerve are thus blocked. The patient is then turned on his back and the abdominal wall block is done. (After Dr John S fundy, Section on Anæsthesia Mayo Clinic)

the accidental opening and contamination of the peritoneum which is difficult to avoid if the incision must be enlarged upward. Two stage suprapubic prostatectomy possesses the dis

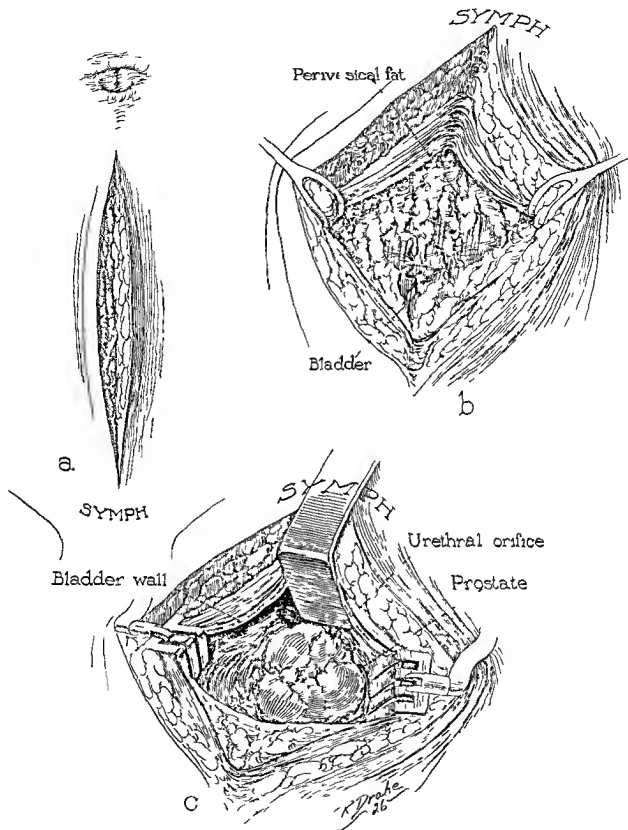


Fig 5 One stage suprapubic prostatectomy *a* Incision extending from just above the symphysis to within four fifths of the distance to the umbilicus provides adequate exposure of the operative field *b* dissection of the bladder with air or solution is unnecessary for its identification the retraction upward of the peritoneum and preperitoneal fat exposes the collapsed bladder readily recognized by its longitudinal muscle fibers *c* insertion of the bladder retractor allows inspection of the interior of the bladder and enables one to see the entire procedure of removing the gland

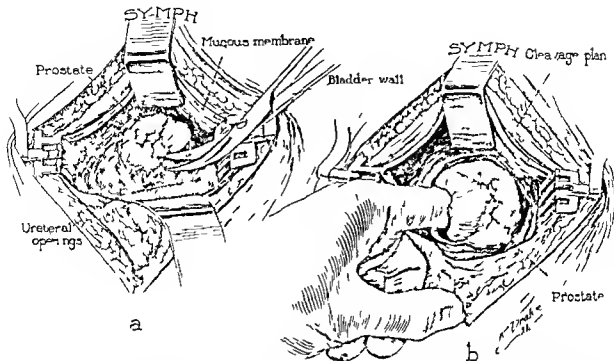


Fig. 6 One stage suprapubic prostatectomy. *a* The mucous membrane around the internal urethral orifice or that covering the intravesical portion of the gland is incised with scissors in order to avoid irregular laceration of the mucous membrane in the subsequent enucleation. *b* The cleavage plane in adenomatous hypertrophy of the prostate is established in the anterolateral wall of the prostatic urethra and is carried about the entire circumference of the gland within the capsule.

the exposure of the one stage operation by virtue of the rigidity of the tissues and the presence of a urinary sinus and it is usually not advisable to attempt obtaining it as the chances of opening the peritoneum would be increased. Harm may not result from the accidental opening of the peritoneum during the course of two stage prostatectomy; however such accidents if they do result in urinary contamination of the peritoneum add a distinct hazard to the procedure. Peritonitis and death following such an accident are not unknown. To avoid the accident after preliminary cystostomy it is usually advisable to sacrifice the advantage of exposure and to extirpate the gland by more or less blind enucleation. In most instances this is accomplished bimanually, the index finger of the left hand enucleating the gland while the index finger of the right hand in the anus elevates it (Fig. 2). Many urologists prefer that the assistant should elevate the gland, but the situation is best controlled by the surgeon himself.

ONE STAGE SUPRAPUBIC PROSTATECTOMY

Secondary in importance only to pre-operative preparation of all patients, the change during recent years, in methods of anesthesia has con-

tributed much to the safety of the operation of prostatectomy. The desirability of avoiding the inhalation types of anesthesia has long been realized. Certainly the burden of general anesthesia is not lightly borne by patients whose organic reserve is reduced incident to the average age and the result of prostatic obstruction.

Intraspinal anesthesia obviates the disadvantages of general anesthesia and provides complete relaxation and complete anesthesia of the operative field. However the reactions incident to disturbances of blood pressure make one question whether it is entirely safe. The method has been extensively used and highly recommended in this field of surgery by Chute, Gardner and others. It remained for Labat to popularize in this country a method of regional anesthesia recently modified by Lundy (Figs. 3 and 4), which provides complete anesthesia of the operative field. This method possesses none of the disadvantages of general anesthesia and is devoid of the potential dangers of intraspinal administration. Sacral anesthesia in skilled hands but rarely requires the supplementary aid of any other method.

The incision through the median line extending from the pubes to within four fifths of the dis-

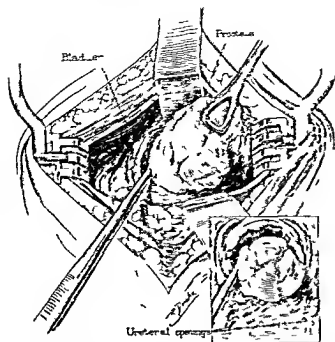


Fig 7 One stage uprapubic prostatectomy. The gland is elevated into the bladder by means of prostatic forceps as the instrumental enucleation proceeds.

tance to the umbilicus (Fig 5, a) provides adequate exposure for the one stage visible operation. The reflection of the peritoneum and preperitoneal fat is variable, however, it is readily stripped off the dome of the bladder (Fig 5, b). Many surgeons distend the urinary bladder with air or irrigating solution. This possesses no merit except as an aid in identifying the bladder, for which purpose it is not necessary as identification is readily made by the longitudinal muscle fibers. Distending the bladder with water or other solution only favors the dissemination of infective material around the operative field when the bladder is incised and is inimical to the favorable healing of wounds. The insertion of the bladder retractor allows examination of the interior of the bladder and enables one to see the entire procedure of removing the gland (Fig 5 c). As the first step in the actual removal of the gland the mucous membrane around the internal urethral orifice or that overlying the intravesical part of the prostate is carefully incised with scissors in order to avoid irregular laceration of the mucous membrane in the subsequent enucleation (Fig 6, a). The absence of an anterior lobe favors establishing the cleavage plane for the enucleation in the anterolateral wall of the prostatic urethra, which may be established by the index finger, and then the enucleation completed with the finger or instrument throughout

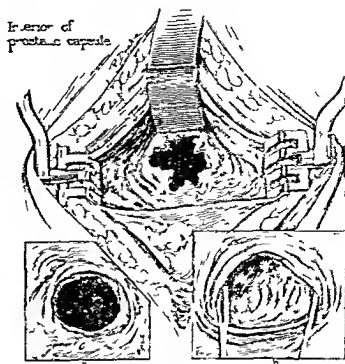


Fig 8 Treatment of the vesical defect. In the unexposed operation irregular tags of mucous membrane may persist to become agglutinated and form a diaphragm with subsequent obstruction at the vesical neck. This is obviated by obtaining the exposure of the one-stage operation and incising the mucous membrane with scissors before the enucleation or trimming off the tag immediately after removal of the gland. a At the completion of the operation the neck of the bladder should present a clean cut circumference devoid of irregular laceration or tags of mucous membrane. b Inspection of the interior of the prostatic capsule after removal of the gland insures against the oversight of persisting adenomata or fragments of gland tissue.

the entire circumference within the capsule (Fig 6 b). In cases of adenomatous hypertrophy the cleavage plane is very definite and entirely within the capsule of the gland, it is most readily established anteriorly and when accurately obtained favors the enucleation of the entire adenomatous enlargement of the median and lateral lobes intact and at times with the entire circumference of the prostatic urethra (Fig 7). In approximately 15 per cent of the cases prostatic obstruction is the result of inflammatory enlargement of the gland so-called prostatitis in which a distinct cleavage plane does not exist. The visible operation makes possible a careful excision with scissors of the gland or its obstructing portion.

Inspection of the prostatic capsule is essential to make sure that small adenomata do not persist (Fig 8). Such adenomata have been known to continue to grow and produce obstruction so that subsequent removal is required.

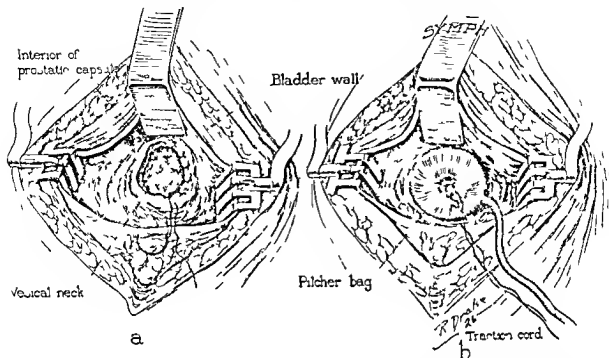


Fig 9. Hæmostas: a Bleeding from the vesical neck after prostatectomy is readily controlled by interrupted sutures b the Pilcher bag is not drawn entirely into the prostatic capsule but is allowed to impinge on the vesical neck. In this position it supplements the sutures and traction necessary to maintain the bag in place exerted on the internal sphincter instead of the external sphincter.

ILEMOSTASIS

Accurate control of bleeding is absolutely essential to the safety of the operation. Numerous ingenious methods of providing hæmostasis following prostatectomy have been advocated. Massage of the prostatic capsule immediately after removal of the gland has to some extent controlled bleeding from the interior of the capsule. The capsule has been irrigated with hot liquids such as boiling water, boric acid solution and hot bichloride solution, probably first suggested by McGill in 1888. Various tampons inserted into the prostatic capsule and methods of suturing the capsule have accomplished a certain degree of hæmostasis. Thromboplastic substances, chiefly kephalin, have served to reduce postoperative bleeding. Before the advent of the Hagner bag and Pilcher's modification of it, probably the most effective means was to pack the prostatic capsule with iodoform gauze and allow it to remain in place several days. While gauze has usually been effectual its effectiveness is the result of the gauze becoming enmeshed in the granulation tissue of the capsule. When it is removed bleeding of variable degree is often precipitated and occasionally severe secondary hæmorrhage occurs.

The bag presented by Hagner answered a distinct need and serves as an excellent means of hæmostasis within the prostatic capsule. Pilcher's modification of the Hagner bag is likewise a most effective method of hæmostasis. The bag is usually adequate in controlling bleeding not only from the capsule but from the vesical neck as well. Judd and Cabot were the first to advocate interrupted sutures at the vesical neck to control bleeding, and hæmostasis is most complete when the sutures are used in conjunction with the bag (Fig 9, a and b). Trauma to the urethra by the use of a special sound in the introduction of the bag is obviated by passing a urethral catheter as a guide for the sound which may be passed before the urethral tube is attached. The urethral tube of the bag is withdrawn, attached to the sound and the bag drawn into place (Fig 10) impinging on the vesical neck or internal sphincter rather than passing entirely into the prostatic capsule so that it may supplement the sutures in control of bleeding at the vesical neck and the traction on the bag may be exerted on the base of the bag at the vesical neck rather than at the apex of the bag on the external sphincter (Fig 11). The bag is distended with water to the point of complete hæmostasis. The amount of disten-

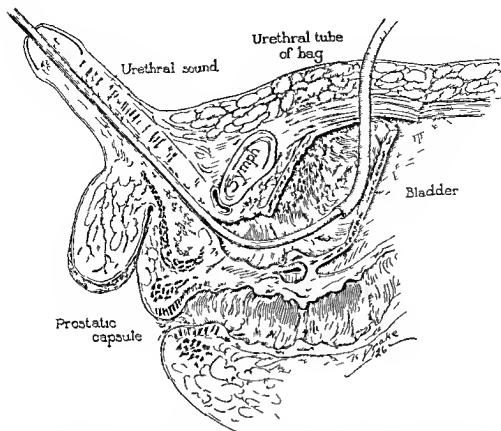


FIG. 10 Introduction of the Pilcher bag. The urethral tube of the bag is attached to the special urethral sound by which the bag is drawn into the prostatic capsule on withdrawal of the urethral sound

tion necessary is not constant, but varies with the size of the prostate and the size of the capsule after removal of the gland. Excessive distention of the bag is not essential to the complete control of bleeding and may exert a harmful effect on the sphincters of the bladder. Over distention of the bag may cause it to thin out in one portion with subsequent rupture and defeat of its purpose. Distention of the bag to the point of hæmostasis exerts a pressure within the bag of about 140 millimeters of mercury.

Traction is necessary to retain the bag in place. Direct traction on the urethral tube of the bag is exerted on the apex of the bag and in turn on the external sphincter, thus jeopardizing its subsequent function. To avoid injury to the external sphincter traction is best directed on the base of the bag and on the internal sphincter by means of a silk strand passing through the urethral tube and attached to the ring in the base of the Pilcher bag. This strand is also attached to the ring of the Hamer tripod (Fig. 12). By virtue of the unchangeable distance between the bag and the point of fixation of traction a constant and unvarying degree of traction is maintained.

With complete hæmostasis suprapubic drainage is maintained only while the bag is in position. A No. 30 male catheter provides adequate drainage and allows a sufficient opening on its removal for the suprapubic withdrawal of the collapsed bag. The bladder is snugly closed about the suprapubic tube of the bag and catheter with plain catgut (Fig. 13, a), the first row approximating the edges of the mucous membrane and the second row approximating the edges of the muscle in the bladder wall. The fascia is closed with chromic catgut and the skin and subcutaneous tissues approximated with interrupted silkworm sutures. It is advisable to drain the extravascular space for 48 hours with a split tube (Fig. 13, b).

POSTOPERATIVE MANAGEMENT

The use of regional anæsthesia allows the continuation with little interruption postoperatively of the pre-operative regimen as regards diet, administration of liquids, and so forth. A competent special nurse is essential to the best postoperative care for at least the first few days in all cases.

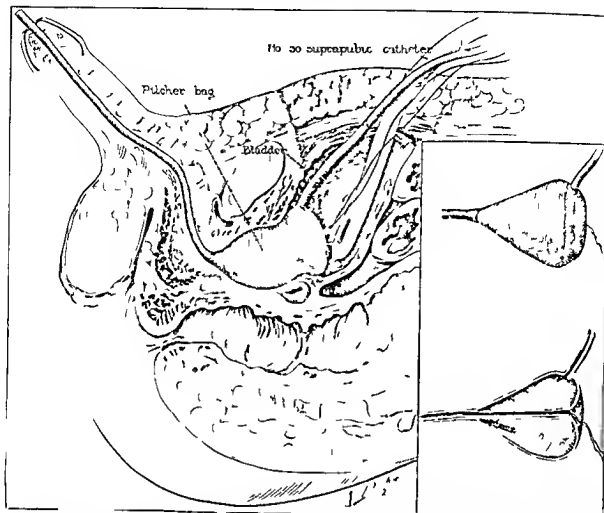


FIG. 11. Pilcher bag in position. The Pilcher bag when inflated conforms to the contour of the prostatic capsule irrespective of its size. The amount of distention necessary varies with the size of the capsule but should never be more than sufficient for complete hemostasis. A No. 30 male catheter provides suprapubic drainage only for the time that the bag is in place.

The pre-operative management and preliminary treatment of actual or potential uræmia eliminate the probability of postoperative uræmia. They have restored the renal reserve to normal or to normal limits obviating the necessity for postoperative stimulation of elimination by means other than the kidneys so that the drastic use of saline cathartics is avoided. A liquid intake of at least 3,000 cubic centimeters daily is maintained and in most instances rectal or subcutaneous administration is not required.

Considerable difference of opinion exists regarding the length of time the bag is required. In most instances 6 hours is probably long enough and there may be little reason for prolonging the time beyond 12 hours. However, deflation of the

bag 12 to 16 hours after operation insures the greatest safety from secondary bleeding. In about 4 per cent of cases even after this length of time re-inflation for several additional hours is necessary. After deflation of the bag it is allowed to rest in place for several hours to insure against secondary bleeding at which time the withdrawal of the suprapubic catheter provides a sufficiently large opening for the ready removal of the collapsed bag. Immediately preceding removal of the bag a No. 20 male catheter is attached to the urethral tube of the bag and drawn into the bladder as the bag is removed. The urethral catheter subsequently provides drainage of the bladder and is maintained in position by adhesive to the penis. It is not necessary to maintain

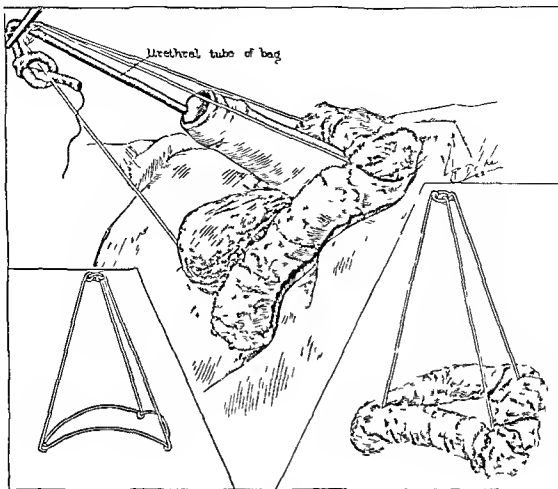


Fig 12

Fig 12 Traction on bag The Hamer tripod provides a method of maintaining an unvarying degree of traction on the bag The traction is exerted upon the silk strand passing through the urethral tube of the bag to its base and not upon the elastic urethral tube and in turn upon the external sphincter

Fig 13 Closure of the wound *a* The bladder is snugly closed about the suprapubic tube of the bag and the catheter with plain catgut the first row approximating the edges of the mucous membrane and the second row approximating the edges of the muscle in the wall of the bladder The catheter upon its removal allows a sufficiently large opening through which to withdraw the collapsed bag readily *b* the skin is closed with interrupted silkworm sutures

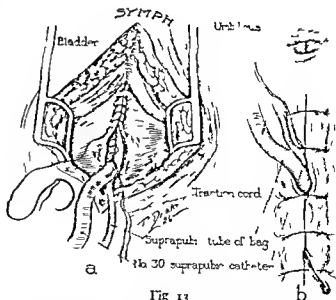


Fig 13

prolonged suprapubic drainage when hæmostasis has been accurate and complete It prolongs healing of the wound unnecessarily and delays the establishment of urethral urinary function The urethral catheter is maintained in position from 10 to 14 days, by the end of which time the suprapubic wound in most instances is healed, on withdrawal of the catheter voluntary urethral urination occurs This method of drainage obviates a persistent suprapubic urinary sinus, reduces

the length of time in hospital to a minimum, and is followed by excellent functional results

There is little reliable evidence to support the contention that the judicious use of the urethral catheter before and after operation contributes

to the incidence of epididymitis Epididymitis occurs in a variable percentage of cases, its greatest incidence is not during convalescence in hospital but after the third month, and is in all probability due to cicatricial contraction about the ejaculatory ducts with resultant retention and infection ascending to the epididymis

Some difference of opinion exists regarding postoperative irrigation of the bladder It seems that it contributes little to the welfare of the patient and it may do harm by precipitating secondary bleeding However, the daily installation of a 1 per cent solution of mercurochrome seems to possess some merit

SUMMARY

The successful management of the patient with surgical prostatic obstruction demands meticulous care in the pre operative, operative, and postoperative procedures The pre-operative treatment in all cases most successfully combats actual or potential uræmia and provides opportunity for improving the cardiovascular renal reserve The visible operation insures the patient against surgical accidents and the use of regional anesthesia is devoid of depressant effect on the kidneys and obviates the occurrence of the post operative pulmonary complications incident to the inhalation anesthetics

FROM THE CLINIC OF ROVSING, UNIVERSITY OF COPENHAGEN

THE TECHNIQUE OF MY METHOD OF ANTETHORACIC OESOPHAGOPLASTY

BY THORKILD ROVSING M D COPENHAGEN

IN the last 20 years, the attention of surgeons has been very extensively occupied with the problem of making a new oesophagus by a plastic operation, especially the problem of helping the patient suffering from a benign stricture of the oesophagus caused usually by swallowing caustics. In most of these cases the stricture can be relieved or the oesophagus kept open by the introduction of bougies but the patient very often returns soon with a bad recurrence, the passage of bougies having become more and more difficult and at last quite impossible. The patient becomes emaciated and we are forced to make a gastrostomy to keep him alive. Such a gastrostomy is really a wonderful help at first, but added to the fatigue and depression it causes, it does not afford the possibility of sufficient nourishment to the hard working man.

In 1907, the well known surgeon, Roux of Lausanne, perfected the method of 'antethoracic oesophagojejunostomy' which had been theoretically proposed 3 years previously by Wullstein. This is a very complicated operation. A 40 to 50 centimeter loop of jejunum is excised and its caudal lumen implanted into the stomach, while the oral lumen is drawn through a subcutaneous channel in front of the sternum up to the jejunum where in a second stage it is united with the upper healthy part of the oesophagus.

This operation is very dangerous for several different reasons:

1 The risk of peritonitis is great because a patient who has already been subjected to a long standing gastrostomy must submit to a very complicated intraperitoneal operation. The skin around the gastrostomy is often ulcerated and irritated and is difficult to clean. The presence of the gastrostomy leaves a narrow and difficult space for the laparotomy, therefore the contents of the stomach enter the cavity and soil the wound.

2 The nutrition of the transplanted loop of jejunum is very poor and is easily interrupted by torsion of the small pedicle of the mesentery or by compression between the skin and sternum, with the result that the new oesophagus becomes totally or partly gangrenous.

Hence the many efforts to simplify the method!

Kelmg, Vulliet, and von Hacker used the transverse colon thinking it would be more mobile and better nourished than the jejunum. I think that the greater risk of septic infection from the contents of the colon outweighs the advantages.

To me, the most reasonable modifications are those in which the stomach itself is used as a transplant.

Von Fink (1913) severed the duodenum near the pylorus closed the caudal part, and drew the central stump of the duodenum and stomach up under the skin to meet the cervical part of the oesophagus. A simultaneous gastro-enterostomy was of course a necessary supplement.

Kirschner, fearing the antiperistalsis, made use of the opposite end of the stomach cutting it at the cardiac end and drawing the cardiac part up between the sternum and skin to meet the oesophagus. Here it was necessary to make an anastomosis between the jejunum and cardia.

Less dangerous is the method of Janu who makes a new oesophagus of the greater curvature of the stomach. By two parallel incisions a long flap is dissected free from near the pylorus up to the fundus of the stomach. The stomach wound

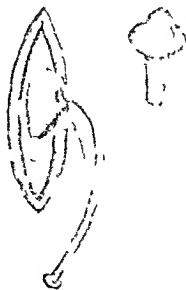


Fig 1

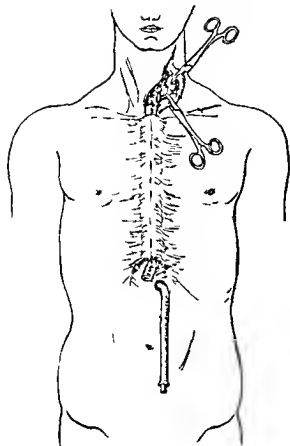


Fig. 2

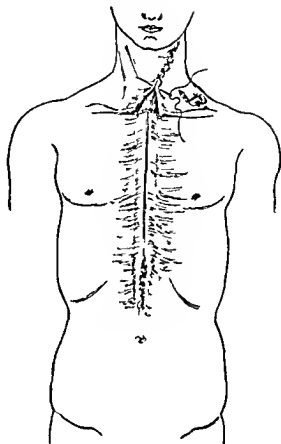


Fig. 3

is closed up to the base of the flap where a new cardia is formed by uniting the borders of the flap to a channel which is then drawn up as an ante thoracic gullet.

This method has three questionable features (1) the long suture line (2) the possible delay in healing caused by the action of hydrochloric acid and pepsin which is produced by the mucous membrane and (3) possible antiperistalsis.

I beg to remark that all these dangers and difficulties of the different methods are the result of the conviction that the new gullet must be capable of peristaltic motion. *Is this true?* This is the question I have put before myself thinking that if peristalsis were not necessary we could form the new gullet without all the mentioned risks by a simple skin plastic. The answer was not difficult many facts showing me that peristalsis is not at all necessary.

I noted that in most successful cases the peristalsis if present at all, very rapidly disappeared whether the new esophagus was formed from the jejunum, colon or stomach, and this fact is not

surprising because the transplant grows very intimately together with the surrounding tissue.

Moreover Gluck's and Torek's cases show that a simple rubber drain uniting an esophagostomy with a gastrostomy will function for years in a very satisfactory manner. In Torek's famous successful case of *resectio oesophagi* his patient an elderly woman was still alive 10 years after he extirpated the cancer.

These considerations led me to work out the following more simple and less dangerous method which I have performed successfully in 4 cases. All 4 patients are now cured and very happy. The first patient, whose history was published in *Hospitalstidende* for January 1923 was operated upon February 17 1921.

TECHNIQUE OF THE OPERATION

First stage Gastrostomy. The laparotomy incision extends from the ensiform process 6 to 7 centimeters downward in the center line. Two silk threads are caught in the serosa of an area of the anterior stomach wall about the size of a dollar

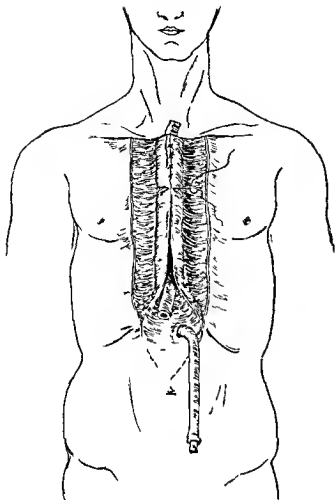


Fig 4

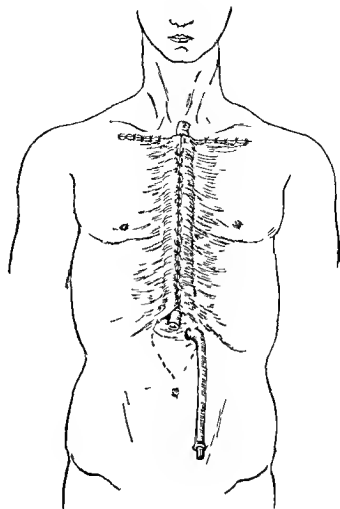


Fig 5

situated far enough up so that it can be freely drawn out and sutured to the parietal peritoneum. Just at the point where the two central silk threads are brought out, I make an incision in the left rectus muscle from its inner border outward, cutting cautiously half through the muscle. The peritoneal cavity having been closed by a series of silk sutures in the periphery of the dollar size area of stomach wall, I put traction on the two silk threads so that the stomach is drawn up in a cone shape, and having protected the surrounding surfaces of the wound, I open the stomach with a small incision between the two silk threads and dilate the opening with small blunt forceps just enough to admit the largest size Pezzer drain. The button of the Pezzer drain is fastened tight to the anterior wall of the stomach so that not a drop of fluid can get out by the side of the drain (Fig 1).

At last the aponeurosis and the skin below and above the Pezzer drain are each sutured with aluminum bronze wire and the suture line is protected with collodion and absorbent cotton. Sterilized

fluid food can, if necessary, be administered immediately after the operation.

Second stage As soon as the patient has regained sufficient strength to stand a new operation, I perform an œsophagostomy. Through an oblique incision along the anterior border of the sternocleidomastoideus I dissect the œsophagus free far enough so that I can run a finger around it and lift it up to the incision in the skin. Between two tongs I cut the œsophagus through. The inferior end is then brought out through the small incision in the left supraclavicular fossa, fixed here to the skin by silk sutures and drained with a tight rubber drain to exclude every danger of mediastinitis. The oral end of the œsophagus is very accurately sutured to the skin in the lower part of the oblique incision, the rest of the œsophagus above the œsophagostomy being closed in the usual manner. A rubber tube is introduced from the mouth into the œsophagus and led out through the œsophagostomy (Figs 2 and 3).

Third stage When the œsophagus is entirely healed to the skin and easily permits the passage

of food I measure the circumference of a thick rubber drain of just the size I want the new œsophagus to be. This measure represents the distance between two parallel incisions of the skin on the thorax from which I dissect the skin free inward so far that it can be united in the central line around a drain one or two sizes smaller than the drain, the measure of which I used as an indicator for the distance between the two incisions. Other wise it might be difficult later to remove the drain. At the upper end the two skin incisions are made to meet each other above the œsophagostomy. At the lower end the two parallel incisions are not made to meet each other around the gastrostomy, as it must be kept open until the upper part of the antethoracic œsophagus is quite healed. The lower ends of the incisions correspond to the plane of the gastrostomy. Outward the skin is bluntly loosened or, if this is impossible, dissected free from the fascia and mobilized sufficiently so that the two lateral edges of the incision can be united in the median line. With women this is usually easy to do, but with men and emaciated children it may sometimes be necessary to make some relaxing incisions. The wounds are covered with nitrate of silver gauze and absorbent cotton. The

œsophageal drain is brought down into a low placed glass receptacle (Figs 4 and 5).¹

Fourth stage. When the wound is well healed the Pezzer drain and the œsophageal drain are removed, the gastrostomy closed, and the two parallel incisions made to meet each other around the œsophagostomy (Fig. 3).

My experience with this method convinces me that it represents an important step in the progress of the operative treatment of these very difficult and serious cases. The method reduces the risk to a minimum, giving as good functional results as the old very dangerous methods.

The only dangerous moment is when we are cutting the œsophagus cervicalis through, but I find this quite necessary. A side opening in the œsophagus is insufficient for the outward passage into the skin tube, and permits the food to enter the cul de sac above the stricture where stagnation, decomposition and inflammation may take place. It is much better to drain this cul-de-sac thoroughly as is done by my method which insures perfect cleanliness.

¹ In my first case the œsophagostomy was the third stage, the antethoracic it to be the second stage, hence the incongruity which the reader may have remarked between the description and the illustrations which were made after the first operation.

ATRESIA ANI VAGINALIS, ITS CORRECTION

WITH REPORT OF A CASE¹

By NORMAN F. MILLER, M.D. ANN ARBOR, MICHIGAN

Asistant Professor in Obstetrics and Gynecology University of Michigan

ATRESIA ani vaginalis is not a common condition. The incidence of the lesion is not definitely known, but an idea of its frequency may be gained from the knowledge that anal or rectal malformations of some type or other occur once in every five to fifteen thousand newborn infants and that atresia ani vaginalis is one of the most common of these lesions. Rickham (5) believes it to be the most common type of anal deformity in females. No doubt the frequency is even greater than the above figures would indicate, since some cases are practically symptomless and undoubtedly, pass through life unrecorded.

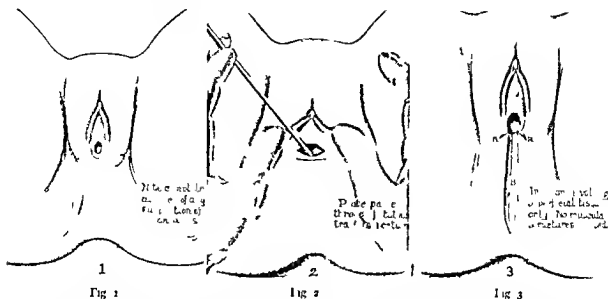
In this type of anal deformity the normal anus is absent. In its place there may or may not be a dimple or depression marking the normal anal site. The rectum, instead of opening through the anus, terminates directly or through a fistulous tract in some portion of the vagina. This opening is generally low, the vaginal fourchette being a common location. Although the opening may be in any portion of the genital tract, a higher opening is less frequently seen. As might be expected the higher the opening the more severe the symptoms and the more difficult the treatment.

The condition is due to a developmental defect. During the first few months of intra uterine life the ectoderm at the normal anal site invaginates preparatory to uniting with the down pouching of the hind gut or what becomes the rectum. This normally occurs by the twelfth week of fetal life. Incomplete development or non union in this process results in imperforate anus. While some of these individuals show a distinct but imperforate anus, others reveal no evidence of the normal anal site, as in the case to be reported. During these early weeks of development the cloaca functions as the common outlet for both intestinal and urinary tracts. Synchronous with the union of the hind gut and anal indentation as mentioned, a division or partitioning of the cloaca normally occurs. This partition later becomes the recto vaginal septum. When however, this partitioning process is incomplete and non union of the rectum and anus occurs, atresia of the anus with a rectovaginal fistula or atresia ani vaginalis results.

Various causative factors have been advanced to account for this lack of development. Prominent among these are poor blood supply, adhesions and inflammation. Heredity it would seem, plays no part in the etiology of the condition although Ayer (2) reports two children of the same family afflicted with the condition. Smiley (14), on the other hand, reported a woman with atresia ani vaginalis who gave birth to a normally developed infant.

The symptoms produced by atresia ani vaginalis vary considerably. Much depends upon the location, size and existence of the sphincteric fibers around the opening. When the opening is large no symptoms may be apparent until later in infancy. The irregular escape of feces and gas is not unexpected and in infancy does not suggest anything particularly abnormal. Should the opening be small, however, symptoms may appear after the first few days of birth. The child may have no difficulty in passing the soft meconium but as time goes on the normal feces may produce considerable difficulty as revealed by severe colic and constipation. These symptoms may increase until symptoms of true obstruction occur, as in a case reported by Fitzgerald (7). The mother was unaware of her daughter's condition until the child was 2 months old. Difficulty in normal evacuation had become more and more marked and constipation more prominent until finally the mother investigated and found the above condition. When the opening is large and control is exhibited by the existence of sphincteric fibers in the surrounding tissue, there may be no symptoms at any age. Such individuals may pass through life unconscious of their deformity. Morgagni (quoted by Brenner (6)) reported such a case, a woman who lived to be over one hundred years of age who bore children, yet was never aware of her unique condition. When the opening is small symptoms are apt to appear early, although the symptoms are seldom acute. Constipation, colic, vomiting, tympanites and more rarely serious symptoms of obstruction are present. In older or neglected cases, impaction of the bowel with feces produces an enormous distention of the rectum, lower large bowel, and abdomen.

¹From the Department of Obstetrics and Gynecology University of Michigan



Frequent watery stools with incontinence occur due to the drastic catharsis generally necessary in the individuals and to the canalization of the impacted feces. Flatulence was not a prominent symptom in the case to be reported. Headaches, malaise, muddy complexion with symptoms of chronic obstruction are to be expected in the more severe or long standing cases. At its best the condition produces much discomfort and suffering. While the physical suffering is of greater importance, the mental anguish of individuals thus afflicted and old enough to understand their condition must not be overlooked. Disregarding the physical pain and discomfort, the constant and uncontrollable leakage of gas and feces forces the already reticent individual farther into the social background and she becomes in fact if not in theory socially ostracized.

Marriage in uncorrected cases except in very exceptional instances is contra indicated. Should marriage be contemplated, the potential dangers from infection at the time of confinement must receive serious consideration. Where some semblance of control exists through the presence of sphincteric fibers, the mental and physical suffering is no doubt greatly diminished, but few patients thus afflicted show any evidence of bowel control.

For immediate treatment in the newborn, simple dilatation is generally satisfactory. In fact, no further treatment should be instituted until the age of puberty is reached. This point has been stressed by many observers. Operation previous to puberty, upon the undeveloped struc-

tures of the infant or child is not satisfactory and an efficient result cannot be expected. Furthermore, the dangers of operation in infancy being greater than at puberty, render it unwise to subject the child to such unnecessary risks.

Operation unfortunately does not always result in complete cure. The immediate results have generally been good, but control has been poor or remained entirely absent. Then too due to the extensive dissection with the formation of scar tissue, a gradual narrowing of the lumen not infrequently occurs, requiring frequent dilatation. Prolapse of the bowel occurs due to absence of sphincteric support and to the cone shape of the anal opening. Regardless of the incomplete cures in these individuals, operation still offers much in the way of relief. The mere fact that a distinct and separate anal orifice is established is in itself an improvement and a welcome relief to the afflicted individual.

Operative treatment has consisted in an attempt to bring the lowest portion of the rectum down to the perineum where it was opened and fixed to the skin edges. The vaginal opening was then closed, but usually broke down or it was left to close of its own accord as it frequently did when a normal anal opening was established. This procedure was often difficult. Extensive dissection was frequently necessary to reach the lowest portion of the rectum and when reached it was often impossible to bring the rectum down to the skin surface. Rizzoli (12) in 1856 first devised a satisfactory method of treating the lesion with a low or vulvar opening. Later in 1865 he reported three cases with vulvar opening treated

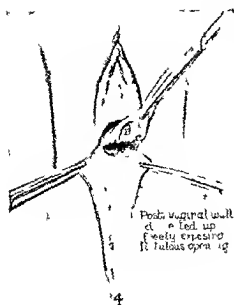


Fig 4

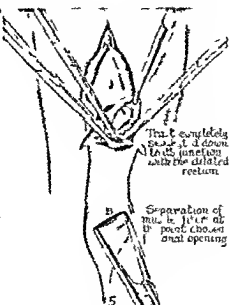


Fig 5



Fig 6

by his method. His procedure was to incise the skin and superficial tissues between the rectal opening at the posterior fourchette and the coccyx, then reflect the two flaps laterally and, by dissection, free the rectal opening. The opening was then transplanted from the vulvar region down near the coccyx. The operation was completed by fixing the opening to the skin edges, approximating the superficial tissues, and closing the cutaneous flaps. His results, apparently, were successful. When the opening is higher, more difficulty is encountered and, as previously mentioned, ultimate cure is not always obtained, because of the inability to obtain good sphincteric control and because of the narrowing of the lumen due to the extensive scar and cicatricial contraction. When sphincteric action exists in the tissue surrounding the rectovaginal opening, much may be accomplished in the way of preventing incontinence after operation by the use of the procedure suggested by Gant (8) and others. A considerable portion of the tissue surrounding the rectovaginal opening, with the sphincter fibers existing in this region, is included in the transplant. When no sphincteric function has been present, the operator must devise a remedy for this deficiency in addition to forming a normal anal outlet or opening. The method utilized by the writer in the correction of the case here reported would seem to offer the best chance for complete sphincteric control later as well as the least possible contraction due to scar tissue formation.

Miss G. T., case No. 18308, age 15, was examined in the out-patient department of the Obstetrical and Gynecological clinic at the University Hospital on August 17, 1924. Ex-

amination showed a well-developed intelligent girl of 15 in fair health except for her complaint of constantly passing small amounts of semisolid feces through the vagina and the difficulty of obtaining a thorough evacuation. Her complexion was good and clear. General examination was essentially negative until the abdomen was investigated. This revealed an enormous distention of the entire lower portion rising almost to the rib margin on the left. There was no muscle spasm and no particular tenderness on examination. Palpation gave a doughy sensation throughout the entire area. The mass followed the outline of an enormously distended large bowel. Vaginal examination revealed an unruptured hymen, but examination was made without particular difficulty. The cervix and uterus were carried high up to the right and the entire pelvis was filled with a boggy and doughy distended rectum. The appendages could not be felt. The examining finger could only be passed up behind the pubis because of the marked anteroposterior flattening of the vagina. Careful investigation revealed an opening large enough to admit the finger tip lying more than one inch inside the vagina in the posterior wall and slightly toward the left. The vagina and rectum were connected by a fistulous tract approximately one and one-quarter inches in length as revealed by introducing a sound and later the examining finger. No anus was present. Not even a dimple existed to show the normal anal site. So far as could be determined, the distance between the skin surface at the normal anal site and the lowest portion of the rectum was approximately one and one-half inches.

History revealed no particular difficulty during early life but for the past few years she had noticed more and more difficulty in obtaining bowel evacuation, even with cathartics. There was constant escape of gas and liquid feces. The abdomen had become very much larger and hard, but there was no particular pain. No control of the bowel had existed at any time. Menstruation had begun 1 year ago and had been normal until recently when it was accompanied by pain and backache.

It was thought that many operative difficulties might be avoided if the lower bowel could first be thoroughly evacuated. With this in mind a colostomy was attempted. The operation was never completed because of the impossibility of bringing even a small portion of the enormously distended colon up through the wound.

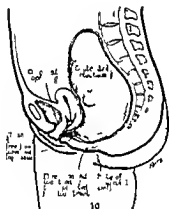
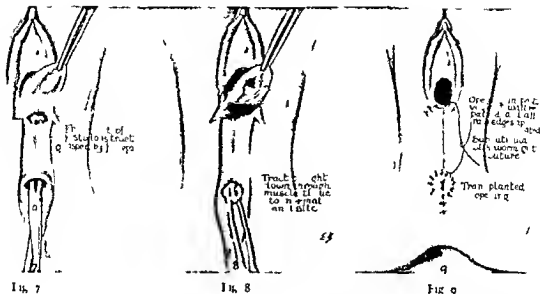


Fig 10

The abdominal incision however permitted palpation of the pelvic viscera. The uterus, tubes and ovaries were well developed and entirely normal except for the marked displacement to the right as previously mentioned. For a period of 3 weeks following this attempt strenuous efforts were made to evacuate the lower rectum through the recto-vaginal opening by means of small enemas. At the end of this period though the lower rectum was slightly diminished in size the remainder of the bowel remained unchanged.

On September 12 1924 a second operation was performed and the deformity corrected as follows. An incision was made from the vaginal fourchette to the tip of the coccyx through the skin and superficial tissue no muscular structures being severed (Fig 3 b). Two small incisions were next made in the lower lateral part of the vagina to give more room (Fig 3 aa). A circular incision was next made about one eighth of an inch outside the recto-vaginal opening in the posterior vaginal wall (Fig 4). More tissue was not included since no control had been exhibited and apparently no sphincteric fibers existed in this region. The posterior vaginal wall or mucosa was then dissected free

as in an ordinary perineorrhaphy (Fig 4 c). After this the entire fistulous tract connecting the vagina and rectum was dissected free from the surrounding tissues by blunt dissection. This dissection was carried a little beyond the junction of the tract with the rectum proper (Fig 5 a also Fig 10).

The patient was then permitted to react lightly from the anesthetic and the perineum closely watched during the retching which followed. Definite phincteric activity was noted at the normal anal site. The contraction was not violent but very distinct. A blunt hæmostat was introduced in the center of this region and carried up to the junction of the fistulous tract and rectum (Fig 5). No muscle fibers were cut. The finger was next introduced through the passage formed by the hæmostat and the newly formed canal thoroughly dilated (Fig 6). The vaginal opening of the fistulous tract was then grasped with a clamp and carried down through this newly formed muscular tunnel to the site of a normal anus (Figs 7 and 8). The anal opening was then fixed to the skin edges. This was facilitated by excising a semicircle of skin on either side. The opening in the vaginal flap and the space left by transplanting the fistulous tract were closed. All raw edges were then approximated as in an ordinary perineorrhaphy a subcuticular silkworm suture being used on the skin edges (Fig 9).

Recovery was uneventful. Thinking that dilatation might be advisable before the patient was discharged an attempt to dilate the canal was made on September 26 1924. This was found inadvisable however due to the short interval since the operation and the incomplete though primary healing. The patient was therefore advised to return for this procedure in 2 months after union of the tissues was sufficient to stand the strain of stretching. The patient was discharged from the service October 11 1924 with the advice to take a daily cathartic until the abdominal enlargement had disappeared.

Palpation on December 12 1924 revealed a normal soft abdomen while rectal examination showed excellent healing and approximation of the mucosa and skin edges. The examining finger was introduced with but slight difficulty. The rectum beyond the junction with the fistulous tract seemed entirely normal. Vaginal examination revealed a

normal pelvis. There were no palpable masses and the pelvic viscera were in normal position.

On December 19, 1924, the anal passage was thoroughly dilated by means of Hegar dilators. At first control was only fair, but with constant effort to exercise and develop her sphincter muscle, which had so long remained functionless, improvement became rapidly apparent. Now the patient writes that she has good control and has two bowel movements per day. She has gained about 25 pounds in weight and is anxiously waiting for the time when she can take up nursing.

CONCLUSIONS

The procedure described seems to offer a simple and logical means of correcting atresia ani vaginalis for the following reasons:

1. Avoidance of extensive cutting tends to lessen scar tissue formation and contraction with narrowing of the anal canal.

2. The use of the fistulous tract for the anal outlet renders the procedure simple and practical.

3. Utilization of the apparently normal sphincter results in entirely satisfactory control.

4. The development of normal sphincteric support materially lessens the chances of rectal prolapse.

BIBLIOGRAPHY

1. ASHLEST. Univ. of Penn. Med. Bull. 1901-1908-1920 footnote p. 98.
2. AYER. Boston M. & S. J. 1838 lvi pp. 510.
3. BECK. Chicago Med. Recorder 1901 Jan. June 4, 8.
4. BEVAN. Surg. Clin. Chicago 1920 iv 3, 1.
5. BUCKHAM. Operative Surgery vol. 1 pp. 91-92.
6. BRENNER. Congenital defects of anus and rectum. Surg. Gynec. & Obst. 1915 xx 582.
7. FITZGERALD. Brit. M. J. 1898 i 945.
8. GANT. Diseases of the Rectum, Anus and Colon vol. 1 p. 123.
9. GASTON. Internat. Clin. vol. iii p. 217.
10. HIRSCHMAN. Handbook of Diseases of the Rectum p. 67.
11. OLIVLAND. Boston M. & S. J. 1922 clxxxvii p. 875.
12. RIZZOLI. Mem. d. Accad. Bologna 1856 viii p. 51.
13. Ibid. 1863 ser. 2 v. 213.
14. SMILEY. J. Am. M. Ass. 1911 lvi p. 2047.

THE FATE OF THE FRAGMENT—A STUDY OF COMMINUTED FRACTURES

BY F. E. CLOUGH, M.D., F.A.C.S., LEAD, SOUTH DAKOTA

MY object in choosing *The Fate of the Fragment* as my title is to bring out a discussion on the debridement method when applied to injuries received in civil life.

The plan of mechanically cleaning out wounds is not a new idea as it is first mentioned in the writings of an Italian surgeon Guy de Chauliac in 1363 as translated by W. A. Brennan of the Crerar Library, Chicago.

Debridement in the late war was first practised by the French and later adopted by all the Allies. Gas gangrene, the cause of death in thousands of injuries in the early years of the war, was found to be much less common if all badly lacerated or contused tissues could be quickly removed. Hence it became the custom to excise if possible all questionable tissues during the first few hours after injury. Not only did the war surgeons find that gas gangrene was materially lessened but that all types of infections were cut down to a considerable degree. This meant that wounds which could be rendered mechanically clean at once and then vigorously treated with antiseptics could either be closed by primary union or delayed primary union and the patient returned to work more quickly than if other methods were used. Hence by cutting down the number of deaths from gas gangrene and diminishing the actual loss of time on account of injuries, a twofold economic problem was greatly relieved.

However, one must not forget that war time conditions were out of the ordinary. The physical state of the active soldier was better than that of the average citizen and helped him to offset the unsanitary surroundings under which he was forced to live and work. On the other hand, his intimate association with a highly infected and polluted soil made his chance for an infected wound far greater than would be that of the patient who received an average injury in civil life.

No one questions the fact that debridement saved many lives. On the other hand, if we admit that this method was often used to ward off infection, then we may raise the question as to whether or not the radical removal of all diseased soft parts and bone as well, did not materially prolong the period of convalescence and give end results no more satisfactory than those obtained by other methods. After having seen returned to a base

hospital in this country after the armistice, a multitude of fracture cases with enormous sluggish wounds of bone and soft tissue still present, one wonders if in the necessity for standardizing wound treatment, debridement had not been used somewhat more extensively than it would have been under other conditions.

If the main reasons for debridement in war surgery were to ward off gas gangrene and to diminish both the frequency and virulence of general infections, then in civil life—the patient coming to the doctor within a short time after the injury and remaining under his care until healing is complete and the probability of severe infection not being great—is the surgeon justified in radically removing not only all soft tissues which seem to have impaired life but all fragments of bone as well? If he is not justified in performing such radical measures, are there certain types of fragments which should be taken out while others are allowed to remain?

What becomes of the fragments in a simple comminuted fracture?

In a badly comminuted simple fracture the fragments often lie at all angles to the shaft with sharp points close to the skin. From experience gained in operative work, one can say that some of the fragments are torn loose from their periosteal coverings while others are completely detached from all soft tissues. The fact that their blood supply has been temporarily interfered with does not mean they should be cut down on and removed as useless foreign bodies. Rather they should be manipulated and brought into as close line up as possible and immobilized in that position. Absolute anatomical reposition can rarely be obtained and is not necessary. Even though the alignment is not perfect, nature will eventually form solid union, will increase the compact tissue on the side carrying the bulk of the strain and will ultimately round off all projections so that a good looking extremity will be found 2 or 3 years later. The formation of a sinus leading down to a sequestrum is a very uncommon occurrence following a simple fracture treated by closed methods.

The handling of a compound fracture is as much a soft tissue as a bone problem. In addition, there is always the possibility of an infection entering which may cause trouble, although the number of

seriously infected compound fractures is relatively small if the fracture is treated soon after the injury is received.

Before discussing the fragment in other types of fractures, it is appropriate to outline our plan of handling compound fractures.

Attention is called to the fact that our injury cases reach us within a very short time after the accident, which makes a great difference in the percentage of infections. No time is lost in securing immediate reduction and immobilization. We believe that a delay of hours in order to secure X-ray plates or to get somebody to help is to be condemned. It is a rare thing in our service not to have the first reduction completed and the patient in bed within half an hour and much quicker in the majority of cases. It is of more than passing interest to mention that tetanus has never been seen in our mountainous country (altitude one mile), hence anti-tetanic serum is never administered even though the wounds be contaminated with dirt.

First aid to the injured has been so well taught in our industry that no unprotected fracture reaches us. This is limited to the application of a sterile, non-medicated dressing and suitable temporary splints or the patient is fastened on a transportation stretcher.

The injured extremity is carefully held and the clothing is removed so that the two extremities may be compared. This is a most important point especially from the medicolegal standpoint.

The wound is protected and the extremity is washed with soap and water, an aesthetic, if not a surgical requirement. From then on, the treatment depends upon in which of two groups the injury belongs. In the first group we have one or more small openings caused by a spicule of bone or the sharp edge of a fragment piercing the skin. If the surface of such a fracture is painted with iodine and the same drug poured into the wound and if possible a sterile dressing applied, the wound will soon become healed and the fracture can then be treated as a simple fracture.

In the second group, with large skin openings and lacerations and the loss of soft parts, a more serious problem is presented. In these cases every section of the wound should be thoroughly painted with iodine. It has been our policy to cut off all injured skin which looks bad but to be conservative about excising the underlying tissues, for we have found that time and again there would have been practically nothing left if all the injured tissues had been removed. We have occasionally seen soft tissues from which, when cut, no blood would flow, become viable and share in the



Fig. 1. J. O. Compound comminuted fracture of the forearm. Before union and after.

processes of repair. Hence, in our service we seem to have just as good or better results when active soft tissue debridement is not carried out. If at the first sitting, one does not take out all questionable diseased tissue but waits for the presence of a line of demarcation, the end results seem to be about as satisfactory. Therefore we are not enthusiasts on the subject of debridement. In civil life, an infection in a compound fracture is rarely severe enough to cause death.

What is done to reduce the fragments?

The patient is immediately given a general anesthetic, is placed on a fluoroscopic table and as perfect a reduction made as is possible. Here, manual dexterity counts for much. There is a certain knack acquired with long experience. Fracture reduction requires not only muscle power but brain effort as well. Angulation of the fragments will often work when the hardest kind of a direct pull is of little value. Finger pressure over a fragment or clapping the hands around the injured extremity and squeezing hard will often restore normal relations. Simple instrumentation will often help in the first reduction.

It is our opinion that most fragments should be left in place. This applies to those with periosteal or soft tissue attachment or even without such attachment. Bone is produced not only from the periosteum but from the endosteum as well, and most fragments contain either one or the other element. If the fragments are closely approximated and properly splinted and not disturbed after the first few days a blood clot soon surrounds them and union ultimately occurs. Time



Fig 2 M L Compound comminuted fracture of the femur Before and after union

and again we have seen shafts so comminuted that a 3 or 4 inch hiatus would be present if all loose fragments had been removed. In such a case, we prefer to take chances with the fragments rather than with an autogenous bone graft. If a third or a half of the thickness of the shaft remains in line one may be justified in removing whatever fragments are loose and unattached in the wound. Or in case it is impossible to push a fragment down into a muscle bed it may be removed.

The triangular shaped fragment comprising more than half of the thickness of the shaft will almost always grow if forced back into its normal position.

A fragment consisting of the entire section of the shaft of a long bone presents a serious problem when detached at both ends. Suturing such a piece from the radius ulna or fibula rarely succeeds, but if it is done and does not live *in toto* it acts as an autogenous bone graft and serves the purpose of bridge work for new bone formation.

In case the fragments cannot be molded by the hands it is then proper to do more radical open work. The fracture is widely exposed and if the fragments cannot be interlocked and held in position, we fasten them in place by whatever method is most applicable to the individual case. We believe that one is not justified in putting in an

autogenous bone graft as a method of internal fixation in a fresh fracture in a healthy individual. We feel this is adding an unnecessary insult to the original injury.

Neither do we believe that a surgeon should unhesitatingly and without exception condemn the use of metals of various kinds. Many a time we have been pleased to have at our disposal steel plates, nails, screws and different sizes of wire. We have seen more than one case impossible to hold in proper alignment, heal perfectly with internal metal fixation. The necessity of removing the metal at a later date is of little consequence. In our experience we have seen but two cases of fibrous union following steel plate application, a small number compared with the total number of delayed or non union cases in which no internal fixation of any kind was used.

Since adopting the experimental work of Zierold of Minneapolis given us in a personal communication several years ago, and using only copper plates, screws or copper wire for internal fixation we feel that our end results have been greatly improved not only in those cases requiring internal fixation but in non union cases as well.

We are adherents of complete immobilization for such injuries. We are not over zealous in the use of irrigating fluids in infected fractures and look askance on the wet soaked bed so common



Fig 3 F G Compound comminuted fracture of upper third of leg Immediately after injury, and after union

with most of us when the Dakin technique is used. We believe in heat and massage but have never recovered from our war time disappointment in the use of all types of electrotherapy.

Of course, we have seen an occasional sinus with a sequestrum at the bottom, which should be removed, but we have never seen a case which did not ultimately heal after the dead bone had been removed and bismuth paste instilled. Even though a sinus is present, the injured man is not necessarily kept from working.

Considerable research has been done by investigators both in this country and in Europe relative to bone formation, the latest of which is by Rohde of Freiberg (1). As his conclusions based on animal experimentation bear out our clinical work, we desire to discuss his paper briefly.

The periosteum is composed of two layers, the outer or adventitia, which is connective tissue throughout and which contains no osteoblasts, and the inner or cambium, which is very thin and holds the osteoblasts. The entire periosteum receives its blood supply through the soft tissues with which it is intimately associated and the blood passes through the outer layer into the cambium cells. There is no blood supply or at least none of consequence from the inside to this tissue.

During childhood, there is no line of demarcation between the two layers of the periosteum, but in adult life, if the periosteum is stripped from the

bone by blunt dissection, the cambium layer does not come with it but remains attached to the cortex.

The endosteum, which is a thin membrane separating the medulla from the cortex contains osteoblasts and receives its blood supply entirely from the nutrient artery of the bone and its branches, and none from the outside whatever.

In order to stimulate normal adult periosteum and endosteum to form bone, three factors are essential: first, a trauma, second, active hyperæmia, and third, tissue destruction which acts as an agent to continue hyperæmia until bony union is complete. If these contentions are true, as based on many animal experimentations, then can one see that adult bone fragments containing cortex also hold the cambium layer with its osteoblasts and therefore, are potential bone forming elements which should never be discarded?

If tissue destruction is necessary to produce a hormone, or agent of any type which continues active hyperæmia, then it is wrong to cut out all questionable tissue which may produce this hyperæmia.

Mechanical irritation, as by continuous and early active motion of the fragments, causes injury to the endosteum which results, not in bone formation but a proliferation of non specific connective tissue between the fragments and a resulting pseudo arthrosis. Hence, both those who advocate no splinting of fractures and those who

practise very early active and passive motion are in danger of forming a greater number of delayed or non unions than would occur were the teachings of Rohde carried out

Attention is also called to the recent work of Robison (2) of England who believes that bone and ossifying cartilage produce an enzyme which has the property of converting the highly organized hexose monophosphate esters present in the blood cells into an inorganic phosphorus which is deposited in the bones. He believes that this enzyme is secreted from that portion of the bone adjacent to the bone forming layers. Hence if fragments with their attached cambium cells are taken out the secretion of this enzyme must be materially lessened and the chances for non union increased rather than diminished.

Of all the perplexing questions to answer the one relative to lost time is the most difficult. A number of years ago the author (3) worked out a schedule to show the earliest time at which patients could return to work after all types of fractured legs. Recently (4) the series was augmented and comparative sheets issued. In the last series of cases the patient returned to work more quickly and the entire credit was given to the newer methods used. Whether this should be the case is questionable. We have all shortened

the time of disability have taken off splints at an earlier date than formerly, and have discharged patients much more quickly than we did years ago. Analogous to this is the change in handling abdominal surgery. How many of us have for gotten the starvation period prior to all elective abdominal surgery and who would have dared 25 years ago to have allowed a patient upon whom a laparotomy had been done out of the bed at the end of the first week?

So it is with fractures. The author does not wish for a minute to belittle the excellent work of the war surgeons during those trying times but desires merely to call attention to the fact that fractures and their complications in war time are quite different from those in civil life and should be treated by distinctly different methods.

The author desires to express his thanks to Drs. Donald Macrae of Council Bluffs and Kellogg Speed of Chicago for information on débridement as used by them during the late war.

REFERENCES

- 1 Rohde Surg Gynec & Obst 1925 Dec
- 2 Robison Biochem J 1923 viii 286 1924 viii 140
- 3 Clough J Lancet 1916 Sept
- 4 Idem Internat J Surg 1914 Aug

INTENTIONAL FRACTURE OF THE HUMERUS IN THE NEWBORN

BY DWIGHT I. CLARK, MD, FACS, EVANSTON, ILLINOIS
Attending Surgeon, Evanston Hospital

THE title, "Intentional Fracture of the Humerus in the Newborn," might at first suggest either surgical boldness or a craving to present the unique to a medical audience or both. If such be the apparent inference, the situation should nevertheless be tempered by the fact that the writer has, after a reasonable search of the literature, failed to find any definite report of cases. That men have intentionally fractured the humerus in the newborn in order to save the child or the mother or both, there is probably no doubt at all. Everyone is able to recall instances in which, during the process of a difficult labor, the humerus or the clavicle or the femur has been fractured. Whether such instances were intentional or not may be unknown but my own impression, until the last few years, has been that these fractures were accidental. It has seemed to me that their occurrence was usually followed by a certain amount of remorse on the part of the attending obstetrician and sometimes an effort to justify what was apparently an accident.

Our position today is that a fracture of the femur is probably never excusable, even as an accident. We feel that a fracture of the collar bone is often excusable as an accident, and we may soon be willing to say that breaking it intentionally is justified. There is at the present time no recognized technique for such procedure, which would seem to make it safe even in skilled hands and, without this, the operation might easily run the risk of being classified as bad surgery. With reference to the humerus, however, we take the stand that its accidental fracture is at least excusable on a par with that of the clavicle and that its intentional fracture is, in exceptional cases, thoroughly justified when, in the opinion of the obstetrician, either the mother or the child is in danger. It is superfluous to add that any fracture, either accidental or intentional, in experienced hands, is never to be condoned except in cases in which justifying abnormalities such as are accepted by critical obstetrical practice are shown to exist.

As a contribution to the subject I am taking the liberty of presenting five cases of intentional fracture of the humerus which have been referred to me as such for treatment, during the last 5 years at the Evanston Hospital where, in the maternity department there have been 3,600

deliveries with an infant mortality of 3 per cent and a maternal mortality of 29/100 per cent. Four of these cases were referred by Dr. W. C. Danforth and one by Dr. P. F. Schneider.

LITERATURE

C. H. Holzhausen, in 1899, reports a fracture of the surgical neck of the humerus in a child brought to the clinic because the arm hung limp. The child was born normally without either doctor or midwife. Union resulted in about 3 weeks with ultimate good function.

Truesdale's book, *Birth Fractures and Epiphyseal Dislocations*, published in 1917, derives its material almost exclusively from the New York Lying In Hospital during a period of 6 years. The humerus was the most frequently broken bone during delivery. Incidental to 33,000 deliveries there were 39 fractures of the humerus in 37 infants. Twenty-four of these were produced during breech extraction, 7 were attributed to difficulty with the arms at the pelvic outlet in vertex presentations and in the balance no cause was determined. The site of the fractures was always at or near the middle of the shaft, were transverse, complete, never green stick, and overriding was unusual. In every case, Truesdale states, there was some evidence of radial nerve paralysis as shown by wrist drop immediately following delivery, which cleared up in all cases in a few weeks. Among a half dozen common causes of dangling arm in the newborn, he thinks syphilis is one as shown by specific periostitis in the X-ray. No splint of any sort is used in the treatment. The fractured arm is merely immobilized against the chest by adhesive carried about the body with a small pad in the axilla, and the forearm bandaged in flexion and directed to ward shoulder of the uninjured side. Callus formation was demonstrated in 8 or 12 days. No instance of non-union was reported under this method.

W. Rubsamen, in 1918, without reporting any cases, advocates a method of immobilization and treatment of humerus fracture with the arm held for 3½ weeks in a suitable position by aluminum triangles placed at the axilla, elbow, and on the thorax. The elbow apparently was held in partial extension.

Stromeier, in 1918, criticized Rubsamen's method with the contention that the elbow

should be held at a right angle and the arm should extend directly from the body.

L Von Lesser in 1918 in an article entitled, 'Treatment of Fracture of the Humerus in the Newborn' reports a case of right shoulder presentation followed by version in a strong labor lasting 4 days. There was mal union at 6 weeks when the humerus was refractured and the arm placed in supination at right angles to the thorax in a splint from the fingers to the shoulder extending over the bed with a weight of not more than 500 grammes attached to it. His claim for such a splint was that the movements of the child or its care is not interfered with. His end results 3½ years later showed both arms to be equal in length and, while the outward raising of the injured arm was somewhat limited, it seemed to have more muscle strength than the opposite arm.

G L McWhorter in 1920 reported a fracture of the humerus in a rapid forcible breech extraction with the arms over the head. There was no evidence of paralysis but the malposition of the fragments was corrected under the fluoroscope. The humerus was extended laterally to the body on a board splint placed across the back of the chest. At the elbow another board splint extended upward for the forearm to rest upon. An X ray after completing the dressing showed improvement but not satisfactory position. A successful realignment was then accomplished under the fluoroscope and a molded plaster reinforced splint folded along the chest under the axilla and down the arm to the fingers maintaining the arm in that degree of abduction and the elbow in such acute flexion on the chest as the fluoroscope demonstrated to be proper. The splint was removed in 3 weeks. Alignment and function was satisfactory.

H L Rocher in 1922 presented a new apparatus for the treatment of obstetrical fractures of the humerus. It was similar in principle to his femur fracture splint designed some time previously. The baby is placed on a padded board, serving as a mattress, a little longer and wider than its body. On one side of the board, at shoulder height is a prop inclined at 140 degrees on the horizontal plane of the board in such a way as to make possible immobilization and extension of the fractured arm with adhesive and rubber bands. Small longitudinal splints of card board applied to the arm as may be needed are used to fortify the dressing. Rocher mentions a case brought in by a midwife in which this apparatus made it possible for the child to be carried about and to be breast fed without removal from the board.

John T Williams in 1923 reports 7 cases of injury to the newborn due to difficulty in delivering the shoulders. In one of these the humerus was accidentally fractured. The mother was a \ para the first seven labors being normal and the eighth and ninth being operative. The ninth baby weighed 12½ pounds. In the case of the tenth baby an attempt to deliver the shoulders by Kristeller's maneuver failed and the humerus of the posterior arm was fractured. The baby weighed 13 pounds 3 ounces.

Ehrenfest, in 1933 states that the humerus is often injured in breech presentation, if it is necessary to bring the arm down directly from behind the nape of the neck and if it is impossible to push back the body of the infant a little so that the arm may be carefully wiped downward over the face by passing the introduced hand gently from the shoulder over the elbow down to the baby's wrist. He further states that the obstetrician will be justified in deliberately breaking the humerus or the clavicle in this procedure if in his best judgment a quick delivery is required in the best interests of the baby. In an earlier paper by the same author in 1922, entitled

'Better Obstetrics and the Problem of Birth Injuries of Newborn Infants' it is interesting to note that the only fracture mentioned is that of the clavicle.

W F O'Donnell in 1924 discussing Injuries and Accidents in the Newly Born states that fracture of the upper end of the humerus and separation of the upper epiphysis constitutes the most frequent site of injury to that bone in breech extractions especially when the arms are found in extension. His treatment includes a plaster cast.

J B De Lee in the fourth edition of his *Principles and Practice of Obstetrics*, published in 1924 states: Fracture of the humerus results from direct trauma in delivering the arm. I have twice deliberately broken this bone to save the child and succeeded.

REPORT OF CASES

CASE 1. At July 4, 1921. Weight 7 pounds 2 ounces. Mother is age 32. Breech extraction was performed. The left arm was delivered successfully by Kristeller's maneuver but it was impossible to deliver the right arm by the same method. In order to avoid further delay and in the interest of the baby which was apparently in danger the right humerus was fractured at the middle of its shaft as seen in Figure 1. You will observe that this is a diagonal fracture with marked overriding in contrast to the others in this series most of which are transverse. The best alignment that was possible to obtain is shown in Figure 2 taken the following day. Rubber band extension made possible with application of a Thomas ring splint apparatus corrected the overriding although no film was taken.



Fig 1

Fig 2

Fig 3

Fig 1 Case 1 Fracture of right humerus

Fig 2 Case 1 Alignment on day after operation elastic extension shown

Fig 3 Case 1 Result 4 years 6 months after fracture

to demonstrate the further correction. The final result in this case, however, is revealed in Figure 3 taken January 20 19 0 4½ years later. There was no paralysis in this case.

CASE 2 W December 18, 1924 Weight, 4½ pounds. The mother was age 26 I para. A few days before term she exhibited an altered blood chemistry: blood pressure 180, headache, spots before her eyes, edema of face and extremities, albumin casts, pus and bacteria in the urine, and eclamptic convulsions before and after delivery. Manual dilatation and internal version with breech extraction was performed. A transverse fracture of the left humerus at the middle of the shaft was deliberately produced and referred to me for care. Figure 4 shows the fragments in fair approximation with no overriding but with slight outward angulation. Because of the fair position and the weakened condition of the baby, which was probably premature and therefore under weight, the arm was simply bandaged to the chest with the elbow flexed and held directed toward the uninjured shoulder for 9 days. At this time (Fig 5) no overriding was shown but a slight mal alignment with a fairly well developed callus. The soft callus permitted a manual correction under the fluoroscope. The arm was again bandaged to the chest in the previous position supported by anterior and posterior cardboard splints with satisfactory results and normal function. Figure 6 taken nearly ½ years later shows the satisfactory end result in the case. I am advised by the father that it is impossible to distinguish between the function and contour of the injured and uninjured arms at the present time. There was no paralysis in this case.

CASE 3 F, October 30, 1924 Weight, 8 pounds 61 ounces. The mother was age 31, II para. She was in the second stage of labor for 2½ hours with a right occipito



Fig 4

Fig 5

Fig 6

Fig 4 Case 2 Position of fragments was good and as infant was in weakened condition arm was simply bandaged to chest for 9 days

Fig 5 Case 2 Condition at end of 9 days

Fig 6 Case 2 Picture taken ½ years later



Fig 7

Fig 8

Fig 9

Fig 7 Case 3 Condition at time infant was referred for treatment

Fig 8 Case 3 Two months after injury. Note good callus formation

Fig 9 Case 3 Six months after injury. No shortening demonstrated

posterior presentation that could not be delivered as such. Version was performed with breech extraction. The left hand was held immovable behind the nape of the neck. In the interests of the baby, rapid delivery of the aftercoming head was imperative and the left humerus was fractured manually in order to facilitate this operation. Figure 7 was taken at the time the case was referred to me for care. It shows a transverse fracture of the shaft of the left humerus immediately below its middle. The arm was supported in slight abduction with the elbow at right angle flexion in a tin splint made to measure which had a base encircling about half of the chest. Figure 8 taken nearly months after the injury shows a well developed callus with the humerus in a definite outward angulation and with a slight shortening. Figure 9, taken 6 months after injury, shows a satisfactory end result with absorption of the callus and no shortening capable of being demonstrated. There was no paralysis in this case.

CASE 4 V, October 30, 1924 Weight 12 pounds 5 ounces. The mother was 38 years old IX para, and



Fig 10

Fig 11

Fig 12

Fig 13

Fig 14

Fig 10 Case 4 Condition 5 days after birth

Fig 11 Case 4 2 weeks after birth

Fig 12 Case 4 13 days after reduction of fracture

Fig 13 Case 4 1 week after removal of splint

Fig 14 Case 4 The end result 6 months after the injury



Fig. 15

Fig. 16

Fig. 17

Fig. 15 Case 5. Marked internal angulation of humerus and overriding of fragments.

Fig. 16 Case 5 a week after reduction of fracture.

Fig. 17 Case 5 2 weeks after delivery.

weighed 240 pounds. She showed a four plus Wassermann at the ninth month of pregnancy and was given a crowded specific course of treatment during that month and for 3 weeks thereafter which latter was regarded as an overdue period. Her history showed that the fourth fifth sixth and seventh babies were stillbirths. The eighth lived for 3 months only. She had a very hard and difficult labor with a transverse arrest of the shoulders which necessitated version and breech extraction. It was found impossible to deliver the right arm which was wedged behind the occiput. The right humerus was therefore fractured at the middle of its shaft to facilitate the safe delivery of the child. Because of the desperate condition of the child it was watched carefully for several days until its condition made an X-ray wise and possible. Up to this time the child was limp in all its muscles but after several days watching function had returned everywhere except in the right arm forearm and hand which was found to be paralyzed. Figure 10 taken 5 days after birth shows a transverse fracture of the right humerus at the middle of shaft with marked displacement and overriding. Reduction was made and the arm was placed in a Thomas ring splint with rubber band extension and with a pad elevating the lower end of the upper fragment as shown in Figure 11 taken nearly 2 weeks after delivery. It is interesting to note in Figure 12 taken 13 days after reduction the extensive callus formation with periosteal stripping which extends a great distance above and below on each fragment. At this time the splint was removed to facilitate better nursing care of the baby which had suddenly developed a temperature of 104 degrees and which reached 107.6 degrees one week later with the urine showing albumin casts and sugar. At this time a spinal Wassermann was negative. Following the removal of the splint the baby was able to raise the right arm and normal use returned in a few days thereafter. Figure 13 taken 1 week after removal shows the fairly good alignment under the circumstances and the beginning of absorption of the extensive callus. The end result in this case is shown in Figure 14 taken 6 months after injury. There is a trivial amount of shortening but the alignment is excellent and the result is considered satisfactory. It is interesting to note that an X-ray taken of the left or uninjured arm and forearm 5 weeks after delivery was reported by our roentgenologist as showing no bone pathology present but a little over 3 weeks later there developed a sudden brachial palsy in this left arm which up to that time had shown no birth injury. The explanation of the left arm paralysis should probably rest with the neurologists but the difficulty we had with the prolonged treatment of this latter condition might suggest a late result from brachial plexus

pressure at the time of delivery. The fact remains that in this particular case the arm which was deliberately fractured in order to facilitate rapid delivery made a satisfactory recovery whereas the opposite arm also difficult to deliver did not. Examination of the child on August 11 1925 shows that the function of the right arm is normal but that while the left hand can be lifted to the mouth all movements of the arm are somewhat restricted.

CASE 5 B March 29 1925 Weight 7 pounds 634 ounces. The mother was age 41. She came to term in toxemia and had neglected her own care during the latter months of pregnancy in spite of the advice of her attending obstetrician. Version with breech extraction was performed. Both feet presented with a prolapsed cord and the aftercoming head was rotated to an occipitoposterior position. The right arm was held over the face and the left was caught behind the occiput. In order to hasten delivery in the interest of both mother and child the left humerus was fractured about the middle of the shaft. Marked cyanosis was present for 24 hours after delivery and there was a left sided convulsion lasting several hours with a temperature as high as 105 degrees. The baby had numerous general convulsions and the spinal fluid was found to be bloody. In this case the placental blood and blood from the father were both negative to the Wassermann test. There was present in this case a paralysis of the left arm with marked wrist drop. Figure 15 shows the marked internal angulation of the humerus with overriding of the fragments. Because of the poor general condition of the baby temporary bandaging to the chest wall was done and a week later reduction performed. Figure 16 taken a week later shows some improvement in position but overriding still present. The fragments were then realigned and the arm maintained in a plaster abduction splint with the elbow at right angle flexion and the wrist dorsiflexed. The plaster was carried entirely about the chest for general support. The position of the humerus and the plaster dressing is shown in Figure 17 which was taken a little over 2 weeks after delivery. Over the telephone every possible effort was made recently to induce the mother to bring the baby for an X-ray in order to show end results. All I am able to report is the opinion of Dr. Aldrich the attending pediatrician that function has completely returned and that the left arm seems to be normal like the right. The mother also testifies to the baby's normal function but is prevented by certain religious convictions from submitting to a final X-ray.

TREATMENT

The supinated extension splint of von Le ser the padded board extension splint of Rocher and Rusbamen's aluminum triangles for arm abduction and elbow flexion all appeal as possessing certain advantages. It is certainly important that a newborn baby shall be immobilized in such a way as to make breast feeding possible. In the hands of their particular advocates the splints mentioned have no doubt served very well but our feeling even in connection with this small series of five cases is that as simplified a dressing as is consistent with thorough treatment should be adopted. We feel that the primary dressing of the fractured humerus in the newborn must take into consideration the fact that usually we are dealing with a baby in exhaustion follow

ing a difficult labor. It may be unwise for several days to subject the infant to more than simple card board splints applied merely to the arm. In all probability we should avoid removal to and manipulation under the fluoroscope as well as encircling the chest with any fixation apparatus immediately after delivery in the case of an exhausted infant. As soon as reaction has taken place, however, our inclination is to favor the so-called neutral muscle position of the arm: fore arm and hand. Such degree of arm abduction and elbow flexion should be selected as may favor proper alignment of the fragments together with such dorsiflexion of the wrist as will markedly overcorrect any wrist drop that may be observed. To this end we advise the carefully made plaster dressing similar to that shown in Figure 17 of Case 5.

The chest is completely included in a well padded jacket from the waist line to the axillae which is then continued as a part of the shoulder, arm, forearm, and hand plaster casing of the injured side. In order that the arm, forearm, and hand may be observed frequently, the upper half of the latter portion of the splint from the shoulder to the tips of the fingers is made removable. This plaster cast is perhaps a little difficult to make but it would seem to cover all the requirements of treatment in the average case including comfort to the baby and successful breast feeding. There is no doubt that under careful watching, Truesdale's method of invariably strapping the arm to the chest may be successful in many instances but such a position would seem to deprive the patient of the value of abduction so very important to the recovery of an injured brachial plexus, as well as adequate treatment in oblique and overriding fractures. We feel that complete right angle abduction of the arm and particularly any overhead extension of the arm at all in these cases may be criticised in certain instances as adding a possible insult to an already injured brachial plexus which should have the advantage of more moderate abduction. Unlike Truesdale's series of cases ours were not all transverse. The tendency of a fracture at or near the middle of the shaft of the humerus in the newborn is toward an outward angulation. It is therefore important in all cases, no matter what fixation apparatus is employed to observe and correct any such tendency during the first week or 10 days, while the callus is still soft and capable of being bent. Finally it may be said that commendable as it may be to secure proper alignment of fragments, a perfect anatomical reduction is of little value if the position selected is

maintained longer than the period of complete callus formation (usually about 3 weeks) or is maintained without respect to future circulation, abnormal muscle contraction, or proper relaxation of a lacerated brachial plexus. Our thought in this connection from the experience we have had would suggest that the intentional fracture of the humerus, following as closely as possible the technique outlined below, produces infinitely less injury to the brachial plexus and other soft parts than the more prolonged hooking of the finger in the axilla or about the arm during an effort to deliver.

TECHNIQUE

The production of the intentional fracture of the humerus at or near the middle of the shaft should carry with it the extreme caution of avoiding all unnecessary injury to the brachial plexus or the soft parts. The finger of the obstetrician should be hooked about the arm at or about its middle, selecting if possible the external outer aspect for the application of rapid firm, and positive pressure until the bone is felt to yield. It would seem from our series that a rapid fracture of the bone would produce much less brachial injury than any prolonged pressure, even though the arm is delivered without a break. This we think applies to the application of pressure even at the inner aspect of the arm where, of course, the brachial plexus is open to more direct injury.

REFERENCES

- BAUM BOUQUET A J E Contribution a l'etude des fractures du condyle externe de l'humérus chez l'enfant leur consolidation vicieuse traitement de cette complication par l'ostéotomie linéaire Bordeaux 1891
BURROWS H Congenital dislocation of right humerus Proc Roy Soc Med Lond 1913 111 Sect Stud Dis Child 1, 8
COURTAY P A propos d'une fracture de l'extrémité inférieure de l'humérus chez un jeune enfant J D comm med prat Par 1898 100
DE LEE JOSEPH B Principles and Practice of Obstetrics 4th ed Philadelphia W B Saunders Co 1914
Idem Better obstetrics and problems of birth injuries of newborn infants Am J Obst & Gynec St Louis 1922 15 61-66
EURENFEST H Prevention of birth injuries of child Minn M J 1923 xlv 0-27
GABOIRNE Fracture obstétricale de l'humérus paralysie radiale libération du nerf le 38ème jour guérison Bull Soc de chir de Lyon 1897-8 27 30
GERBER B Foklartores esete egyenapos escegsmengel Gyogyaszat Budapest 1893 xxix 171 also trans (abs) Pest med-chir Presse Budapest 1893 xxix 341
HANNAN Injuries to new born at birth Texas St J M Fort Worth 1916 11 539
HOLZHAUSEN C H Fracture of the arm in a newborn child Med Rec N Y 1899 lvi 715
JENKINS J O Birth injuries to newborn Kentucky M J 1924 xxii 566-567

- KUSTNER H Injury of the child by anesthesia of the mother in labor *Deutsche med Wchnschr* 1924 i 1117 1113
- LARTET L Fractures de l'extrémité inférieure de l'humérus chez les enfants traitement par l'extension et la supination combinées à la flexion *Paris* 1899
- VON LESSER L Zur Behandlung der Humerusfraktur der Neugeborenen *Muenchen med Wchnschr* 1918 lxx 1440
- LOVOT Paralyse fasciculaire du membre supérieur droit chez un nouveau né consécutivement à une fracture humérale produite pendant l'accouchement *Bull et mém Soc obst et gynéc de Par* 1895 r21 r25
- McWHORTER G L Birth fracture of humerus reset with aid of fluoroscope *Surg Clin Chicago* 1920 iv 1155

- O'DONNELL W F Injuries and accidents in newly born *Internat Clin* 1924 i 48-53
- ROCHER H L Appareillage special pour fracture ostéotraciale de l'humérus *Bull et mém Soc de méd et chir de Bordeaux* (1922) 1923 17 19
- RUBSAMEN W Zur Behandlung der Humerusfraktur der Neugeborenen *Muenchen med Wchnschr* 1918 lxx 353
- STERN A and SCHWARTZ I Clinical aspects of birth injuries *Klin Wchnschr* 1924 iii 931-934
- STROMAYER K Zur Behandlung der Humerusfraktur der Neugeborenen *Muenchen med Wchnschr* 1918 lxx 513
- WILLIAMS JOHN T Dystocia of the shoulders in head presentation *Boston M & S J* cxxxix 465 467

OPERATIVE REMOVAL OF OSTEOMA OF LOWER EXTREMITY OF TIBIA

By GUY A CALDWELL BS MD FACS SHREVEPORT LOUISIANA

IN a case of non malignant tumor of the lateral aspect of the lower extremity of the tibia immediately above the ankle joint and directly between the tibia and fibula the problem of removing the tumor presented some difficulties. To maintain good function in the ankle it was essential that the joint should not be invaded and that the continuity of the fibula should be preserved. On the other hand the close approximation of the two bones in their lower extremities and their relation to the important vessels and nerves made an anterior or posterior approach impossible. A lateral approach by doing an osteotomy of the fibula above the tumor and turning the lower fragment outward seemed to be the most logical procedure. The case described was operated on one year ago by this route. The result is a good weight bearing ankle without pain or deformity and with a complete range of motion in all directions.

RÉSUMÉ OF CASE HISTORY

A M white female age 18 years was admitted April 5 1924. The patient had had pain and swelling behind the left ankle for 18 months or 2 years. She did not remember an injury of any kind. However swelling and tenderness usually developed behind the left malleolus after vigorous exercise and for the past 6 months swelling had been persistent and discomfort had been sufficient to limit her activities seriously and to keep her awake at night. No loss of weight or strength and no fever had been noted. Her general health had always been excellent.

The patient was well developed and nourished and walked with a slight limp protecting the left ankle. The foot and leg appeared normal except for swelling behind the external malleolus. There was no atrophy or weakness of the muscles. The arches and weight bearing lines were good. There was no visible swelling on the front of the

ankle or leg. Posteriorly there was fusiform enlargement immediately behind and partially including the external malleolus. There was no redness or heat and no limitation of motion in any of the joints but she complained of soreness on extending or abducting the foot against resistance. On palpation considerable thickening of a doughy consistency was present over the peroneal tendons. Tenderness was marked over the tendons but not on percussion directly over the tibia and fibula. However the pain was quite marked when the external and internal malleoli were pressed together or when they were separated by forcible eversion of the foot.

The Wassermann examination was negative. The hemoglobin and the red white and differential blood counts were within normal limits. Urinalysis was negative.

The X ray examination showed a spherical enlargement outward from the lower portion of the tibia with very little change in the bone structure at that point. The enlargement was evidently an outgrowth from the tibia with some destruction of the adjacent surface of the fibula as the result of pressure. There appeared to be no invasion of the fibula and no destruction of the tibia.

A provisional diagnosis was made of osteoma of the lower extremity of the tibia with erosion of the fibula by pressure.

Progress and treatment. The ankle was put at rest in plaster and the patient directed to use crutches for 2 weeks. At the end of this time the swelling was much diminished over the peroneal tendons and all of the joint movements were free but the tenderness had increased. X ray examination at this time showed no appreciable change. The history and roentgenograms were sent to Dr J C Bloodgood in Baltimore Maryland for opinion. He replied "You have there nothing but new bone formation and the destruction of bone in the fibula is from pressure. You will observe that bone formation is taking place in the rim left of the fibula. From this X ray if there is no disability I would advise against any operation."

The patient continued on crutches with ankle bandaged for 2 weeks longer but the pain increased became more constant kept her awake at night and made weight bearing intolerable. Operation was deemed necessary for



Fig 1

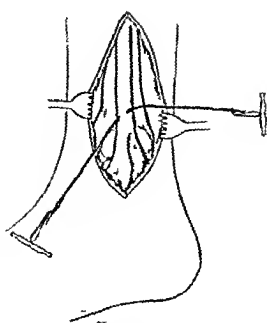


Fig 2

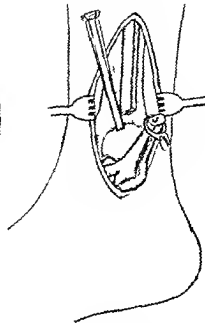


Fig 3

Fig 1 Drawing made from X-ray pictures showing the osteoma in close proximity to the ankle joint projecting from the lateral aspect of the tibia and eroding the fibula.

Fig 2 The lateral incision with oblique osteotomy of the tibia.

Fig 3 Retraction of lower fragment exposing the base of the tumor.

relief of the pain and disability which were gradually increasing even under rest.

Operation Removal of osteoma June 3, 1924. A 6 inch incision extended from the tip of the external malleolus up along the fibula.

Pathology The fibula although eroded by the tumor and somewhat adherent to it had not been invaded by the tumor, there being a clear line of demarcation. When the fibula had been pried away a thin layer of gelatinous material appeared which seemed to be coating the inner surface of the cavity. There was no bony attachment to the tumor. The tumor was about 3.5 centimeters in diameter and was evidently an outgrowth from the outer surface of the lower extremity of the tibia being immediately above the cartilage of the ankle joint. The surface of the tumor externally was rough and consisted apparently of cancellous bone with no areas of cartilage visible. The margins were covered with the periosteum and the base of the tumor flared outward at its junction with the tibia.

Procedure The fibula was exposed in the lower third. The muscles in front and behind were separate and retracted. A high saw was passed between the tibia and fibula about 1 inch above the tumor and the fibula was divided. The lower fragment was then pried loose from the surface of the tibia and retracted outward exposing the tumor and outer surface of the tibia. The margins of the tumor were defined and its base excavated with gouge and chisel. The fibula was then replaced and tied with kangaroo tendon passed through drill holes. Plaster bandage was applied from the toes to the knee.

Progress The wound healed without infection and convalescence was uneventful. Plaster was divided after 4 weeks the wound dressed and light massage and active motion instituted. The patient began light weight bearing after 6 weeks. By September 15, 1924, 3 months after the operation the patient was walking without discomfort or limp and was able to play tennis and dance without pain.

Remarks by Dr J. C. Bloodgood Judging from the roentgenogram made before operation I think we may be quite sure that we are dealing with a benign bone formation. We can see that there is a bulging of the tibia against the lower shaft of the fibula above the epiphyseal line. It gives the impression of a congenital condition. The cortical line is lost and the surface of this bulging dome shaped area of the tibia shows evidence of new bone formation. Corresponding to the projection of the tibia against the fibula is a defect in the fibula but the surface in the concavity defect is also covered with new bone.



Fig 4

Fig 5

Fig 4 Roentgenograms taken before operation, anteroposterior and lateral views.

Fig 5 Roentgenogram anteroposterior view after operation.



Fig 6 Photographs of left ankle showing the range of motion at the end of 3 months after operation

formation. So here the pressure of the bony growth of the tibia has produced a formation of new bone on its surface and while the fibula is being absorbed by pressure the remaining bone surface is throwing out new bone formation.

In my opinion we are dealing with a congenital condition which on account of some static influence has begun to grow.

The gross specimen and sections from the tumor removed show cancellous bone with normal fat. There is no evidence of new bone formation toward the center of the tibia but as we come toward the surface the marrow fat between the bone islands is replaced by dense eosin staining fibrous tissue. On top of this is a good zone of new bone formation denser than cancellous bone and on top of this cartilage. A bony growth with cartilage on this surface suggests a congenital condition yet there is nothing in the roentgenogram to make one suspicious of any cartilage in this new growth. This is the third case of this type of osteoma in this position. The operator here

should be congratulated on his original scheme to resect the fibula and then replace it.

How important it is to have the X ray after operation! Because if we did not know about the pre-operative roentgenogram and the operation and if we did not see the evidence of fracture of the fibula the postoperative roentgenogram might be interpreted as a malignant new growth.

RESULT

The patient was seen at the end of 6 months again at the end of 1 year, and finally after 18 months. She had a complete range of motion in the ankle and foot without pain, and with no discomfort after vigorous exercise.

It would seem therefore that this approach is safe and meets the indications for removal of a non malignant tumor in this location.

AN UNUSUAL RECTAL POLYP ANTERIOR SACRAL MENINGOCELE¹

By ROGER L. J. KENNEDY, M.D. ROCHESTER, MINNESOTA
Section on Pediatrics, Mayo Clinic

NEITHER rectal polyp nor anterior sacral meningocele occurs often in children, and in a search of the literature no reports of a combination of the two conditions was found.

The following is the report of a case of the latter condition observed in the Mayo Clinic. The patient, a female child, aged 22 months was brought for examination because of a mass protruding from the rectum. At 2 weeks of age the child had had a spell in which she lay 'like dead' for 24 hours. There had been no other past illnesses. The mass which had been present since birth had bled at times. Defecation had been very painful, and frequent laxatives had been given.

The child was obese. There were moderate rachitic manifestations, a marked outward bowing of the femoral tibiae and fibulae. A red pedunculated tumor apparently arising from the region of the coccyx covered the anus and part of the vulva (Fig. 1). It was difficult to ascertain the boundary and limits of the pedicle. A proctoscopic examination could not be made because of the obstruction offered by the tumor, but a note was made at that examination to the effect that a polypoid mass protruded from the anus was attached posteriorly and seemed to arise from the coccygeal periosteum. There was a fecal fistula on the left wall of the vagina just above the labium minus. The roentgenogram showed congenital deformity of the sacrum and spina bifida occulta of the fifth lumbar segment. Examination of the blood and urine was negative. The pre operative diagnosis was polypoid growth probably arising from the sacrum or pelvis and involving the recto vaginal septum.

Operation was performed under ether. According to the note made by the surgeon at the time of operation the polyp apparently arose from a bony projection from the right side of the pelvis and extended into the rectum. A definite diagnosis of the condition could not be made. After the removal of the polyp some clear fluid was found the origin of which could not be determined though it apparently did not come from the bladder and no opening could be found in the base of the pedicle of the polyp. The pathological specimen was a polyp 3 centimeters in length (Fig. 2).

The patient did well until 4 days after operation when symptoms of meningeal irritation appeared. Spinal puncture revealed infection with colon bacillus, streptococcus and an organism resembling pneumococcus with numerous pus cells. The severity of the meningeal symptoms increased rapidly and the child died on the night of the fifth day after operation.

Only regional examination was permitted at necropsy at which the entire sacrum was removed. There was a large opening on its anterior surface through which a meningocele emerged into the pelvis. From the position of the ligature which remained from the operation it was found that the pedicle of the polyp was attached to a bony pro-

jection which formed part of the upper margin of the hiatus in the sacrum. The wall of the sac forming the meningocele was continuous at this point with the pedicle and it was evident that this evagination of the sac had been cut across when the pedicle was severed. At the same time the avenue of entrance of the infection which resulted in fatal cerebrospinal meningitis was evident. Roentgenograms were made of the sacrum after its removal which show quite plainly the character of the deformity. In one the hiatus in the bone is plainly seen (Fig. 3). The other a lateral view shows the bony projection at the upper part of the hiatus (Fig. 4).

The point of practical importance to be emphasized is that when a rectal polyp is found search should be made for such an abnormality as is reported here. The presence of a congenital deformity of the sacrum was known in this case before operation this knowledge having been established both by roentgenogram of the lower spine and by rectal palpation of the bony protuberance which extended forward from the sacrum. The spina bifida, however, was designated as one of the occult type inasmuch as there was nothing noted on clinical examination of the spine. Since there was no motor disturbance of the lower extremities and urination and defecation were maintained that is there was no neurological derangement due to spina bifida it was thought to be of no special significance. On repeated rectal examination the examining finger did not come in contact with the meningocele and none was suspected. Operation having been performed and the interior of the meningocele having been infected, the actual condition was soon revealed by subsequent events. A large percentage of the cases of anterior sacral meningocele which have been reported have also terminated fatally possibly because of failure to recognize the real condition.

Since Bryant in 1858, published the first account of anterior sacral meningocele, 19 similar cases have been reported. Three of these occurred in children. Grossman described one in a child of 10 months, in which the stalk and sac passed posteriorly around the side of the sacrum, becoming visible as a swelling in the gluteal region. Roux reported a case occurring in a child aged 8 years. In this instance a large meningocele adherent to the rectum and communicating with the spinal canal by an opening situated a little to the right of the median line, was removed at operation. Complete recovery followed. In Hofmohl's



Fig 1 Rectal polyp



Fig 2 Cross appearance of rectal polyp



Fig 3 (left) Anteroposterior roentgenogram of sacrum showing marked deformity and large opening on anterior surface

Fig 4 Lateral roentgenogram of sacrum. The polyp was attached to the tip of the bony protuberance that extends to the right. The opening in the sacrum from which the meningocele emerged is just below this protuberance

patient, a boy aged 11 years, there was a tumor in the right iliac fossa. The cause of death was not stated but at necropsy part of one of the bodies of a sacral vertebra was found to be absent and there was an enlargement of the resulting intervertebral space with a meningocele which formed the tumor.

The cause of anterior sacral meningocele is not known and the author has no hypothesis to offer which might account for its occurrence.

SUMMARY

A case of rectal polyp associated with anterior sacral meningocele in a child aged 22 months is reported. The simultaneous occurrence of the two conditions has not been reported previously. Anterior sacral meningocele is a rare condition only three cases in children having been previously reported. The cause of anterior sacral meningocele is not known.

The case illustrates the necessity of excluding the possibility of anterior sacral meningocele in cases in which rectal polyp is to be removed.

BIBLIOGRAPHY

1. BRANT: Meningocele sacralis anterior mit Schwangerschaft kompliziert. *Canstatt's Jahrb.* 1858 IV.
2. GROSSMAN: Eine seltene Form der Spina bifida cystica. *Jahrb. f. Kinderh.* 1906 LXXX 221-234.
3. HOFMANN: Ueber das Wesen und die Behandlung der Spina bifida. *Med. Jahrb. Wien* 1878 443-466.
4. ROUX, ZUSANNE: Contribution à l'étude de la ménigocele sacrée antérieure. *Rev. méd. de la Suisse* 1918 XXXVIII 47-71.

STRANGULATED UMBILICAL HERNIA

WITH REPORT OF TWO CASES, ONE A BABY FIFTEEN HOURS OLD

By L. LEYVA PEREIRA M.D. F.A.C.S. BOGOTÁ, COLOMBIA S. A.

TWO cases of strangulated umbilical hernia are presented as curiosities. The fact that one case occurred in an infant and the other in a woman of 70 years would seem to show that surgery properly conducted can afford assistance both in the alpha and omega of life.

CASE 1: Male infant Mrs G 36 years of age married, with nothing of interest in the family history, had had since her marriage 11 years ago 3 children. Nothing unusual occurred either before or at the time of the birth of any of the children and all three of them enjoy excellent health. After the birth of the third child the patient suffered an attack of bronchial pneumonia as a result of influenza. This caused endocarditis with a resulting diastolic thrill in the right ventricle. In addition the kidney was affected by the influenza. Therefore during the attack of bronchial pneumonia and for several days afterward the urine showed traces of albumin.

In this condition in February 1925 Mrs G became pregnant for the fourth time. The feet became swollen, the veins of the neck dilated and from time to time the patient experienced violent headaches which were relieved only by the water diet ordered by the specialist. The least departure from the treatment prescribed however brought on the symptoms with increasing violence.

The thyroid glands grew considerably during the later months of pregnancy. One could almost see them grow. The slightest exercise brought on fatigue more or less intense. The urine showed traces of albumin and the amount secreted was small.

On September 6 1925 the eighth month of pregnancy was entered upon and on this date we were urgently summoned because the patient's condition was very serious as she had a short time previously suffered from a violent attack of asphyxia. The face and extremities were excessively cyanotic. A bloated appearance with the veins of the neck extremely dilated gave the impression that the face had increased considerably in size. A continued disturbed mental condition together with hypertension of pulse completed the picture of a somewhat alarming situation.

While awaiting the arrival of the doctor in charge of the case I wished to effect a blood letting but before I had completed my preparations an abundant hemoptysis occurred which somewhat relieved the patient. This prevented the blood letting since of course one could not foresee if the hemoptysis would recur or not. The doctor in charge decided that since the condition of the mother was poor and no fetal movements could be observed early delivery should be effected by manual dilatation.

About an hour after these manipulations a male child was born in a complete state of asphyxiation and did not begin breathing until after half an hour's artificial respiration. Probably as a result of the movement and handling necessary to restore respiration a part of the small intestine was ruptured and could be seen perfectly through a transparent area around the umbilical cord. The intestine was reduced to its normal position and an ordinary compression bandage applied. During the night the child cried and showed signs of intense abdominal pain.

At 6 a.m. on September 7 the child began to vomit and I was called by the doctor in charge. Complete intestinal obstruction was present with meteorism and intense pain which increased when the abdomen was touched. Across the jelly of the umbilical cord could be seen the intestinal tube dilated and dark in color and the meconium contained within.

There remained no hope of life other than by operation inasmuch as the intestine could not be reduced to its normal place by external means. At 8 a.m. that is to say 15 hours after the birth of the child I proceeded with the operation assisted by Doctor N. Buendía. Two drops of chloroform in a compress sufficed as an anesthetic. This was administered by Señor H. Anzola Cubides a pupil under my charge. The skin was painted with a tincture of iodine and a small incision was made near the left side of the navel. The obstruction which was causing the strangulation was cut from within out. This method was adopted in order to avoid peritoneal contamination a possibility which might have arisen had it been performed the opposite way. The intestine was reduced with the greatest ease. A peritoneal suture was made with No. 00 catgut and the skin and muscles were sewed together with No. 1 chromic catgut. The operation lasted 15 minutes and the child awoke completely transformed. A few minutes later the first meconium discharge took place. The child slept peacefully and without further trouble.

My attention was drawn to the firmness of the peritoneum of the infant, which was easily sewed up with a small curved needle. I had very little hope of the powers of resistance of a child prematurely born under the conditions described. Also I was surprised that the operation could be performed on a child with such facility and that no complication ensued after an operation which is invariably serious for adults.

CASE 2: Señora J. de C. aged 70 years married for 20 years had had an umbilical hernia which caused strangulation on October 5 1924. The operation which was performed under spinal anesthesia induced with a 5 per cent solution of cocaine was carried out in the country under somewhat unhygienic conditions. The transverse colon was found to be strangulated and gangrenous in appearance. It did not react to hot water. In view of this I decided to perform the Mikulicz operation designed for malignant tumor of the intestine. After 8 days the resection was done under local anesthesia and strong forceps were placed on the two tubes of the large intestine. These were left outside the skin like the barrels of a gun. Within 5 days lateral communication was established in the intestine the stercoral fistula closing itself completely 90 days after the first operation.

The principles of the operation used in Case 2, were presented in an article by Charles Mayo in **SURGERY, GYNECOLOGY AND OBSTETRICS**. The results could not have been better than those in this particular case.

DISTURBED REFLEXES THEIR SIGNIFICANCE IN ACUTE ABDOMINAL DISEASES

BY CLORCE ROBERTSON F.R.C.S. (Edin.) DUNFERMLINE SCOTLAND

Honorary Surgeon, Dunfermline and West Fife Hospitals

IN no region of the body is disturbance of reflexes of such important diagnostic value as in the abdomen. Though lives depend largely on the speedy and correct interpretation of these clinical disturbances, yet we still find the symptoms of such a well known disease as acute appendicitis imperfectly understood or misinterpreted even by experienced clinicians. We are all too prone to accept textbook statements without proof and without due consideration. Many teachers of clinical surgery teach this subject badly and we are forced to the conclusion that they do not teach clearly because they do not themselves clearly understand. Mr Zachary Cope who has recently published *Clinical Researches in Acute Abdominal Disease* is a notable exception to the great army of writers on such a subject and he is to be congratulated on his work. This author's name is mentioned because in the writer's opinion he is the first who has shown that he understands and appreciates the important clinical meaning of the disturbed reflex in acute abdominal disease.

The first thing that should strike a clinician and particularly an operating surgeon is that in a definite lesion such as acute appendicitis absolute uniformity of symptoms is not found. In the past and even today such discrepancies have usually been explained by the lie of the viscus that is whether it dips into the pelvis, lies behind the ileum, points toward the spleen or is retrocaecal in position. It must however be of amazing interest to an experienced surgeon during his appendix operations to discover the organ in a lie which he had not anticipated. His explanation of the symptoms as they had presented themselves requires revision. Moreover the condition of the affected appendix very often surprises the operator who has imagined that it will be a non-perforated viscus he is about to remove, or having diagnosed perforation, finds the organ simply inflamed.

As Mr Zachary Cope has emphasized the significance of rigidity it will probably be advantageous to discuss this reflex disturbance first and leave others such as pain and vomiting to a later part. It will be noted that in this series of cases rigidity was found only (1) when the diseased appendix was adherent directly to the demonstrative area of the parietal peritoneum (Cope) (2) when it was adherent to the omentum or to a neighboring coil or coils of intestine which in turn adhered to the 'demonstrative area of parietal peritoneum' or (3) when there was no evidence of any recent direct adhesions as in (1) or indirect as in (2) but when the 'demonstrative area of parietal peritoneum' had been bathed in toxic pus for a lengthy period and was noted at the operation as distinctly inflamed. Here lymph adhesions may have been present and subsequently detached by the pressure exerted by the purulent effusion. The term 'demonstrative area' is on the whole good and Mr Cope defines it as the whole peritoneal lining of the abdominal cavity minus the pelvis and central and inferior parts of the posterior abdominal wall—the silent area. By silent he means of course non-demonstrative to our present clinical methods of examination. The author contends that the abdominal muscles or even certain areas of them which show rigidity locate the recent adhesions associated with the diseased viscus as in (2) when the viscus itself is adherent or in (1) they locate its position very accurately. Rigidity when diffuse and extreme is due to pronounced inflammation of the parietal peritoneum bathed in toxic pus a condition very frequently associated with recent adhesion between gut, omentum, etc., and abdominal wall.

Against Mr Cope's 'silent area' might be mentioned such clinical symptoms as inability to void the bladder requiring catheterization, rigidity of the iliopsoas muscle, and rigidity

of the obturator internus muscle. These have all been demonstrated in many cases of acute appendicitis and have had their own particular significance. Moreover, as rigidity is a reflex phenomenon one would not expect the muscles of the anterior abdominal wall to respond to an afferent stimulus unconnected with them, for instance, from the silent area. The "overflow theory" of reflex action is difficult to disprove but it is also difficult to prove and need not be seriously considered. The "silent area" of the pelvic peritoneum would strongly suggest a negative to such a theory. The writer, however, maintains that this "silent area" does not really exist as such. Its responsiveness only awaits proof by more thorough clinical examination, which is often admittedly difficult to carry out in urgent conditions.

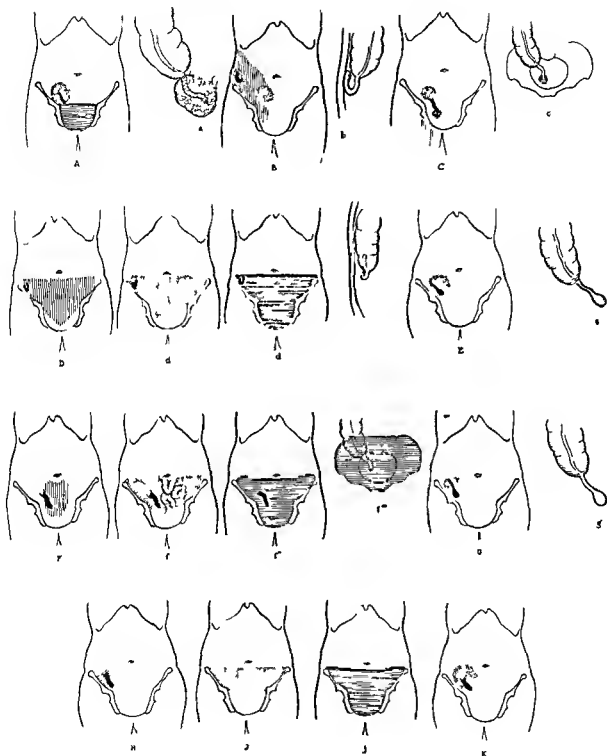
Rigidity in most textbooks and by most lecturers known to the writer, is described as a *visceromotor reflex*. Such a definition in the light of clinical observation is almost certainly incorrect. Its acceptance seems to have led to continued and profound misunderstanding. Rigidity is a *sensory motor reflex*—both limbs of the reflex arc belong to the somatic nervous system. The afferent is a nerve of common sensibility, the efferent is a motor nerve. No rigidity is ever found unless the parietal peritoneum is involved—it matters little whether the area be large or small—the afferent stimulation is through the delicate plexus of sensory nerve fibers lying subendothelially in the parietal peritoneum. Strong sympathetic afferent stimuli from a diseased viscus are not responded by the contraction of a voluntary muscle, they are responded by a strong and continued reflex contraction of the plain muscle of the gut. That is the true visceromotor reflex. It is not a "sign" but is a "symptom," and is expressed by the patient as pain of a certain character and frequently located far away from the diseased viscus. The disturbed visceral reflex, therefore, has two elements (a) the motor, powerful contraction of intestinal muscle, visceromotor visible only in a radiogram, and (b) the sensory, the translation of (a) as pain viscerosensory.

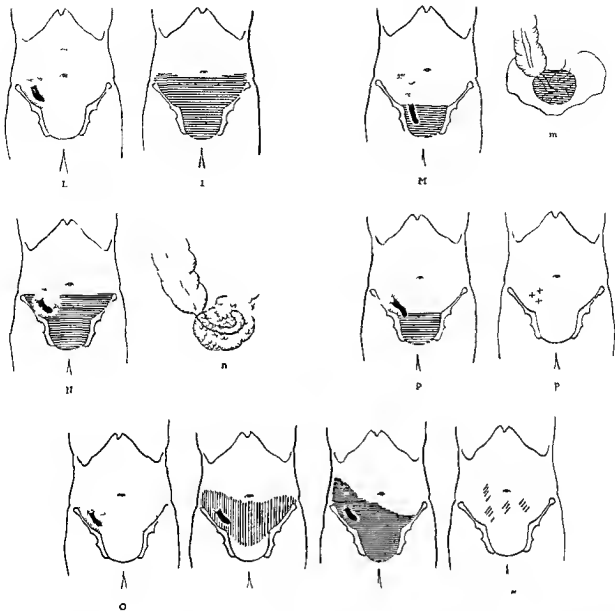
In further considering pain we find that frequently in acute appendicitis the patient

suffers epigastric or periumbilical pains. These are felt in areas far removed from the diseased viscus. They have been described as reflex "overflow" pains. They are not really so. The epigastric pain of acute appendicitis is due to a spasmodic contraction of the pyloric sphincter, and is correctly described by the patient as epigastric. The periumbilical pain of acute appendicitis is due to strong peristaltic contraction of the lower ileum against a contracted ileocaecal sphincter, and is correctly described by the patient as periumbilical. This reflex disturbance is visceral—is a reflex of the autonomic nervous system. Visceral abdominal pain is due to vigorous peristalsis of involuntary muscle or contraction of sphincteric areas often at some distance from the point of stimulation. On the other hand the pain of parietal peritoneal irritation is felt close to the point irritated and thus, in the author's experience, is coupled with definite, though frequently circumscribed, areas of muscular rigidity.

The primary pain of an acute attack of appendicitis is most probably due to vigorous peristalsis of the plain muscle of the appendix, and in a very large number of severe appendix lesions a definite stricture of the viscus is capable of demonstration. The final and frequent localization of the pain to McBurney's point is most probably due to a pronounced and persistent contraction of the ileocaecal sphincter with strong peristalsis of the lower ileum. This statement does not, of course, refer to local adhesive peritonitis which has been already considered.

The "chronic appendix," when it does exist, is diagnosed chiefly from the digestive disturbances it creates. While freely admitting that the appendix is frequently unjustifiably attacked by the surgeon in the treatment of many dyspepsias, we must grant that occasionally a dyspepsia is cured by appendectomy, and, in such a case, undoubtedly, the pyloric spasm is reflex and due to the presence of the diseased appendix, the disturbed visceral reflex. Often, as is well known, during the progress of a case of acute appendicitis, pain lessens in severity, and such an eminent teacher as the late Dr. Murphy of Chicago taught that this occurred in gangrene of the





The author presents for the purposes of this article a series of recent cases (A to P) with explanatory and simple sketches made in the operating room. With one exception a case of pneumococcal peritonitis Case J all are cases of acute appendicitis. Only the chief reflex disturbances are mentioned with a minimum of irrelevant detail. Many more similar cases could be cited.

A a Male young adult duration of attack 24 hours. Appendix enveloped in omentum perforated at tip. No adhesions of enveloping omentum to parietal peritoneum. No adhesions of intestine to parietal peritoneum. Exudate in pelvis. Pain marked over McBurney's point. No rigidity. Vomiting once only at onset of attack.

B b Male aged 12 duration of symptoms 56 hours. Rigidity well marked. Appendix retrocaecal and intraperitoneal. Inflamed distended and adherent by lymph flake to the parietal peritoneum of the flank. No gangrene. No perforation. No adhesions of gut to peritoneum. No exudate. Pain marked over McBurney's point and in the flank. Vomiting at onset of attack.

C, c Male young adult duration of attack 4 days. Appendix found in pelvis, gangrenous and small abscess at

tip which was adherent to posterolateral pelvic wall. Some difficulty complained of in fully extending the thigh also difficulty in passing urine retention. No rigidity of anterior abdominal wall muscles. Pain marked over McBurney's point. Vomited at onset of attack.

D d d' d Male young adult duration of attack 30 hours. Appendix retrocaecal and intraperitoneal. Gangrenous and perforated. Adherent to parietal peritoneum by recent lymph. A few coils of intestine adherent to parietal peritoneum of anterior abdominal wall. Effusion thick and purulent considerable quantity. Rigidity well marked especially over the site of the appendix. Pain over McBurney's point and over whole of lower abdomen.

E e Female young adult duration of attack 12 hours. The appendix showing a few old velamentous adhesions. Its distal end distended and oedematous—lay in the right iliac fossa. No effusion. No rigidity. Pain marked over McBurney's point and in epigastrium. Vomiting repeated and bilious in character.

F f f, f Female child aged 8 duration of attack 50 hours. Appendix very inflamed and gangrenous at the tip. Moderate amount of pus in pelvis and lower abdomen.

Position of appendix pointed downward and inward and dipped into pelvis. Coils of small intestine glued together by lymph and adherent to parietal peritoneum of anterior abdominal wall. Pain diffuse over lower abdomen. Rigidity which was very marked. Recti muscles directly in front of the adherent coils of intestine was also found but not so distinctly in right and left iliac fossae. Vomiting on the first day of the illness.

G g Female aged 20 duration of attack 18 hours. Appendix showed a catarrhal attack. The distal end very bulbous position in right iliac fossa. Pain over McBurney's point no rigidity. Vomiting had been very troublesome since the attack began.

H Female young adult obese. Duration of attack 18 hours. Appendix in right iliac fossa acutely inflamed and distended by foul purulent secretion. No adhesions nor recent lymph no effusion. No rigidity. Pain was very acute over McBurney's point and periumbilical. Vomiting had taken place several times.

J j Case of pneumococcal peritonitis. Female aged 8 duration of attack 12 hours. Pain felt over lower abdomen no rigidity. Free pus in pelvis and lower abdomen.

K Female aged 17 duration of attack 24 hours. Appendix saw egg shape and distended inflamed. No adhesions old or recent no exudate. Peritoneal membrane present. No rigidity. Pain severe and over McBurney's point. Vomiting ushered in the attack and had recurred.

L l Male adult duration of attack 24 hours. Appendix in right iliac fossa sausage shape distended and very inflamed. No gangrene nor perforation. Purulent effusion in pelvis and lower abdomen. No adhesions anywhere. No lymph. No rigidity. Epigastric, periumbilical pain was felt also in right iliac fossa. Had vomited twice.

M m Male young adult duration of attack 3 days. Appendix in pelvis surrounded by adherent loops of gut. These not adherent to pelvic or abdominal peritoneum. Appendix gangrenous but not perforated. Effusion in pelvis and lower abdomen seropurulent. No bladder symptoms. No rigidity. Pain severe over McBurney's point.

N n Male young adult duration of attack 12 hours. Appendix enveloped by adherent omentum was very large sausage shaped acutely inflamed and distended with pus. Enveloping omentum not adherent to anterior abdominal wall. No adhesions of gut to abdominal wall. Effusions seropurulent in pelvis and lower abdomen. No rigidity. Pain very marked over McBurney's point. Had vomited twice.

O o o o Male child aged 6 duration of attack 4 days. Appendix in right iliac fossa gangrenous and perforated. Very foul pus in lower abdomen and pelvis and along right paracolic gutter. Coils of intestine adherent to parietal peritoneum of anterior abdominal wall at points marked in o. Rigidity extensive over lower abdomen. Pain very marked over whole lower abdomen especially over McBurney's point. Parietal peritoneum very much thickened and inflamed. Vomiting marked on the first and fourth days of attack.

P p Male young adult duration of attack 7 days. Acute pain 12 hours duration walked into hospital. Appendix very much enlarged in right iliac fossa but its distal extremity just reached the brim of the true pelvis. It showed two patches of gangrene and perforation. The tip of the appendix was adherent to the peritoneum over the pelvic (true) brim but nowhere were there any adhesions to bowel or bowel to abdominal wall. Purulent effusion in the pelvis. No rigidity was present and the enlarged distended appendix could be easily palpated before operation through the abdominal wall at 1 1/2 in. The patient had a moderate degree of pain over McBurney's point but no vomiting.

appendix. He argued that a dead appendix could have no pain because the nerves of the appendix were dead and he accounted for other variations in signs and symptoms in a manner which could not in these days be termed scientific. The author goes further than Dr. Murphy in saying that not only has a dead appendix no pain but that a living one can be traumatized without pain just as a colostomy can be made painlessly in a conscious patient whose spinal medulla is intact and active.

It might be said of the referred pain of acute appendicitis that the afferent sympathetic impulse is visceral (appendicular wall) the response efferent sympathetic to viscera (pyloric and ileocecal sphincter spasmotic contraction) the latter causing vigorous peristalsis of the ileum, and that these, referred to corresponding spinal segments are interpreted as epigastric pain, right iliac pain (McBurney's point) and umbilical pain. It is very necessary to understand that these referred pains are not 'overflow' in the purely sensory cerebrospinal segments.

Cutaneous hyperesthesia over the appendix region is a reflex which may be easily interpreted. The writer feels bound to say however that he has failed more often than he has succeeded in demonstrating it in acute appendicitis. It is more easily found in chronic catarrhal types of the disease. Some observers have noted an actual diminution of cutaneous sensibility in certain cases.

Vomiting in acute appendicitis is a very variable phenomenon. In many acute lesions it is absent. In many simple catarrhal attacks it is pronounced. This reflex disturbance is often most severe soon after the beginning of the attack of epigastric abdominal pain. It would appear to be most prominent in the type of appendicitis in which the viscus is large and distended in whole or in part. It should be considered a result of the visceromotor half of the disturbed visceral reflex.

The late vomiting occurring in advanced cases of appendicitis with septic peritonitis need not be discussed here.

In conclusion what has been said of acute appendix mischief and its reflex disturbances, applies equally to acute lesions of the stomach,

duodenum, gall bladder, etc. Adhesions between two viscera neither of which is adherent to the parietal peritoneum may reflexly disturb the function of either organ and cause visceral pain. They do not, however, cause the same type of pain as adhesions between a viscus and the abdominal wall.

SUMMARY

Pain in acute appendicitis is of two distinct varieties

1. Localized pain due to localized peritonitis of the parietal peritoneum, that is, involvement of the sensory nerves in the subendothelial layer in this area. This is accompanied by a corresponding localized tenderness of the abdominal wall. It is also accompanied by rigidity of the overlying parietal muscle in whole or only in part. It is never a referred pain.

2. Pain due to visceral muscle spasm. This is without definite tenderness of the abdominal wall, is never accompanied by rigidity, is frequently localized over the appendix area,

but is also very frequently "referred" to the regions of the epigastrium and the umbilicus.

Additional note. Several of my surgical colleagues have asked me to explain why, if my conception of these reflex disturbances is correct, rigidity of the abdominal muscles is found during an attack of renal colic when the extraperitoneal nerves are certainly not involved. My answer is that muscular rigidity in renal colic cases differs essentially from the rigidity found in acute abdominal inflammatory conditions. Renal colic rigidity is not steady and persistent; it is intermittent in character, it is pronounced for seconds or minutes then it disappears only to reappear and soon until the attack of acute pain is ended. Its intermittent character suggests its cause. This type of rigidity is simply an exaggeration of the normal reflexes associated with normal micturition.

When the act of micturition is initiated the abdominal muscles contract to aid the muscle of the bladder wall in expelling the urine. The muscular fibers of the ureter are continuous with those of the bladder; contraction of the former is followed by contraction of the latter. Severe peristalsis of the ureteric muscle—renal colic—gives rise to severe peristalsis of the vesical muscle—frequent desire to micturate—accompanied by strong contraction of the abdominal muscles—the so called rigidity—with retraction of the testis. It may not be generally known that elevation of the testis in a lesser degree occurs at the end of normal micturition.

Renal colic rigidity therefore resembles neither in its persistency nor in its causation the rigidity associated with certain acute abdominal diseases.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D.
ALLEN B. KANAVEL, M.D.

Managing Editor
Associate Editor

WILLIAM J. MAYO, M.D.

Chief of Editorial Staff

DECEMBER 1926

THE ROENTGENOGRAM AS AN AID IN THE DIAGNOSIS OF BONE TUMORS

WITH experience in the interpretation of roentgenograms the surgeon may correctly diagnose most tumors of the osseous system but without it he will save himself from error and embarrassment by using circumspection and inviting aid in their interpretation. The roentgen ray is without doubt the most valuable pre-operative aid in diagnosis and prognosis. Not only does it depict the local character of the growth but it also permits the differentiation of single and multiple forms of certain tumors. With the diagnosis of the tumor the surgeon immediately faces the question of benignancy and malignancy.

The character of the local growth, its origin and site, its osteoclastic or osteoplastic properties, the condition of the medulla, cortex and periosteum, the presence of invasion into the periosteal structures or localization within the osseous structures have a bearing on the diagnosis. Should the tumor be benign it may be either single or multiple. Should it be malign-

ant the question of metastasis arises. Here again the roentgen rays are invaluable as the multiple forms are recognizable long before clinical evidence is available and pulmonary metastasis may be discovered by the aid of the roentgenogram before any symptoms appear in the lungs and even before a primary lesion is suspected.

Certain tumors appear in the diaphysis but rarely invade the epiphysis as is illustrated by the group of osteitis fibrosa cystica in which the epiphyseal line appears to be a bar to growth. On the other hand chondroma, giant cell tumors and sarcoma usually involve the epiphysis. Tumors may cause absorption of bone from without, giving rise to a clear cut area of destruction as in periosteal sarcoma, fibroma and so forth.

The exclusion of inflammatory lesions, syphilis, metastasis from carcinoma and so forth usually presents little difficulty. However, the surgeon will enhance the accuracy of his diagnosis if he obtains further aid through the history, clinical examination and laboratory findings and co-operates with the roentgenologist.

While the diagnosis in most cases of bone tumors may be made from the roentgenogram alone, there is a small group which may baffle the expert, and here the value of the history, clinical findings, laboratory tests and gross and microscopic examinations should not be overlooked.

Both diagnosis and prognosis are often illumined, sometimes profoundly changed indeed by the knowledge contributed by thorough analysis from all aspects. More skillful diagnosis and more accurate estima-

tion of life expectancy depend on how carefully the present available facts are balanced with each other HENRY W MEYERDING

THE CANCER SYMPOSIUM AT LAKE MOHONK

CONVENED by the American Society for the Control of Cancer, a notable group of European and American physicians engaged in work on various phases of the cancer problem, met at Lake Mohonk September 20-24, 1926. The announced intention of this symposium was to "express in concise language the fundamental ground work of fact and opinion upon which the collective effort now being made in the United States for the control of cancer should be continued and extended. The aim is not to start discussion, but to crystallize existing knowledge, not to initiate investigations, but to report upon those productive ones which have already been made, not to raise doubtful points, but to emphasize the agreements that can be arrived at on the basis of existing knowledge."

Representatives from England, France, Germany, Holland, Belgium, Denmark, and Switzerland, joined with the Americans in discussing the subjects that had been assigned them. The subjects considered were the organization of the work for the control of cancer in the different countries, the equipment of institutes for diagnosis and treatment, the hospitalization of patients, and professional and lay education.

Much emphasis was placed on the necessity of early diagnosis and means were discussed for getting the patients to consult the doctor in the early stage, which is the only stage offering reasonable hope of relief in the majority of cases. Prevention of cancer and its dependence on pre existing inflammatory

conditions, was ably discussed. Regarding the etiology of cancer, there was some disparity of opinion, some favoring the parasitic theory and some being unalterably opposed to it. The role of heredity as an important factor in human cancer was minimized by most of the speakers. Co operation in diagnosis and treatment were shown to be a *sine qua non* for success, and shame was poured on the head of the doctor who claimed all sufficiency in diagnosis and treatment. The value of continued investigation into the cause and best methods of diagnosis and treatment was emphasized.

At the conclusion of the symposium, a statement was issued purporting to express the consensus of opinion of those present on the subjects discussed.

This symposium has been productive of much good in showing the world wide interest in the subject of cancer prevention and treatment, and in bringing together as never before a group of men from different countries to show the way in which this problem is being attacked in their respective countries. Doubtless all present have gained from the exchange of ideas and will carry away new ideas of methods to apply in their own countries. Certainly we in the United States and the American Society for the Control of Cancer now know more of how it is being done elsewhere, and have a better foundation on which to base our own work in this direction. Co-ordinated international effort has been productive of much good in the attack on tuberculosis and on some of the more acutely infectious diseases.

It would have been futile to hope that all knowledge of facts concerning the cancer problem could be crystallized at one meeting of this nature. Until the cause, the means of diagnosis, and the infallible methods of treatment of cancer are known, conservatism is the

part of wisdom and one cannot be too dogmatic in the matter. Certainly the statement issued at the close of the symposium was conservative. One is led to wonder whether there are not more positive statements that may be made profitably without overstepping the bounds of prudence. Are there not now certain points on which all authorities are practically agreed that are not known to the general run of those who daily come into contact with cancer cases in their homes and in the clinics? We believe the answer should be in the affirmative.

If this be so then it must be possible that these facts can be collected and impressed upon the physicians by some group of authorities or organizations competent to speak on the subject. Some of the questions which might be submitted to such an organization with reasonable hope of general agreement and helpful answers will readily suggest themselves to those familiar with cancer problems.

1. Of what practical benefit to the practicing physician at the present time is the con-

ception that cancer may be due to a parasitic cause?

2. A non parasitic cause?

3. The ultimate criterion of malignancy is microscopic examination by a competent pathologist. In how far is diagnostic local incision into a suspected tumor justifiable?

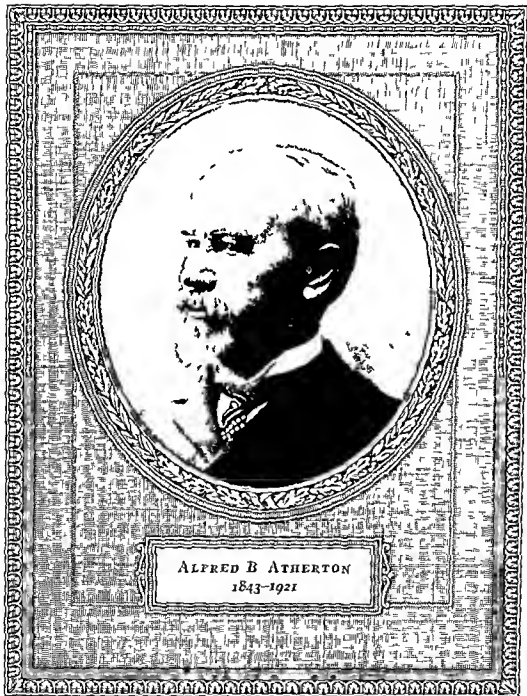
What are the dangers of incisions into tumors? In what types of tumors is such danger the greatest?

4. Excepting skin cancers, what is the effect of pre operative and postoperative X ray or radium?

5. In what class of cancer cases is one now justified in treating by X ray or radium rather than by surgery?

Such a statement of definite facts would supplement the statement issued by the American Society for the Control of Cancer and help to solve present problems, help to save lives and help to keep the public away from the cultists who find such easy prey in the fearful and credulous cancer patient.

BOWMAN C. CROWELL



ALFRED B. ATHERTON
1843-1921

MASTER SURGEONS OF AMERICA

ALFRED BENISON ATHERTON

ALFRED BENISON ATHERTON B A University of New Brunswick, 1862, M D Harvard 1866 L R C P & S Edinburgh 1866 LL D University of New Brunswick, 1900, a charter member of the American College of Surgeons, was born at Queensbury York County New Brunswick January 22 1843, son of John and Charlotte Perley Atherton of Puritan stock who migrated from New England about 1760 On his return from Europe where he had gone for post graduate study he began his practice in Fredericton but a few miles from his birth place Here he evidenced unusual proficiency in surgery

In 1884 he sought larger fields for his usefulness and removed to Toronto where he became attached to the teaching staff of the Women's Medical College, his subject being "The Principles of Surgery" He was appointed surgeon to St John's Hospital for Women of Toronto He returned to Fredericton in 1898 and was appointed to the Surgical Division of the Victoria Public Hospital

Doctor Atherton was a man of pronounced aggressiveness and vigor, rather inflexible in his views, with brusque mannerisms which to his friends were characteristic, but among those who knew him not, or slightly, militated against him

Doctor Atherton was house surgeon at the Massachusetts General Hospital after graduation, and was contemporaneous with many Harvard men who in no small degree contributed to the progress of American surgery It was Dr Atherton's custom to visit either European or American hospitals annually Thus he kept in personal touch with the leaders in the surgical world In fact, at any clinic or hospital in America where it has been my privilege to visit, especially at Baltimore, Chicago New York, Boston, Minnesota University, or the Mayo Clinic I always encounter some one who knew Dr Atherton Often when asked what my home town was, the mention of Fredericton, New Brunswick, Canada, would be followed by "That's where Atherton hails from" I recall very well in 1905 when I called on the beloved William Osler at his home in Baltimore, just before his removal from Johns Hopkins University to Oxford, England, that he invited me into his library and after showing me a few of his most prized volumes, and having interested me in their history he suddenly stopped and asked "How's Atherton? Does he do much fishing now?" Not a little of our time was spent in discussing Dr Atherton whom Sir William Osler held in high regard

Our first meeting occurred in 1897 when I wired him as follows "Come prepared to operate for extra uterine pregnancy" He arrived by next train a distance of 40 miles and received me with a hearty hand shake and genial smile at the same time remarking "That was a rather peremptory telegram, and I am here as directed" My preconception of Dr Atherton was entirely reversed I fancied that he was a man of large physique clean shaven and very serious The man I met however was of short stature about five foot six wearing a carefully kept grey Van Dyke beard of marked physical activity most affable with a massive forehead and penetrating expression We operated at the patient's home, utilizing the 'kitchen table' She made an uninterrupted recovery, still enjoys good health, and since then it has been my privilege to attend her at several normal births In those days the marine sponge was an essential in surgical equipment and I well recall the little bag of them he had and the vigorous means he used to evacuate the clots etc

Nowadays a surgeon who observed the technique employed then would be considered guilty of gross technical error Nevertheless one recalls the many instances of smooth uninterrupted recovery resulting when Lawson Tait's simple surgical cleanliness held sway and it is rather hard to understand how one ever got such good results from operations done in the country under most unfavorable environment especially in cases of compound fracture gall stones, appendicitis tracheotomy emergency gynecological operations, etc Prior to that time I had never practiced in country districts and this experience with an abdominal section at the hands of Dr Atherton made a lasting impression upon me In this section of the country we have produced many good surgeons but there can be no doubt that Dr Atherton was the pioneer par excellence and that the rest of us received our impetus very largely through the example set by this gentleman

Dr Atherton figured among the first of a group of surgeons to have operated successfully for acute perforated gastric ulcer being so mentioned in Denis's *System of Surgery* issue of 1895 his name appearing in this connection with Kreige Morse, Maclearn Michaux Rioux Nicholson Bennett Schuchardt and Kuester It was the writer's fortune to have been associated with him in some of this work

In common with all who have attempted extensive surgery he has been criticized for overdoing the subject and early in his career he became involved in a lawsuit for malpractice wherein a man's arm was sacrificed in an attempt forcibly to reduce an old dislocated shoulder, wherein the axillary artery was atheromatous and ruptured under manipulation The trial in this case resulted in a division in the profession in New Brunswick generally but in Fredericton in particular, as many of the leading men in both the profession of law and medicine were summoned as witnesses also men were brought from Montreal, Boston and elsewhere Thus a schism was born which lasted for many years and in fact died only with the Doctor's removal from here There seems to have been no doubt that this unfortunate experience could very well have been avoided, especially as the patient

was that of another practitioner, who called at the Doctor's office for an opinion and not for an operation. The incident distressed him keenly, I feel quite sure, for in conversation he frequently referred to some phase of it.

Before his removal to Toronto he taught a Sunday School Class in the Fredericton Methodist Church. This he continued to do for 10 years, and many men who were his pupils still speak of the impression made on their minds through him. He was a man of exemplary habits, not given to any but the simplest forms of amusement, notably fishing and curling. The latter sport he took up at the advanced age of 65 years, becoming probably one of the most ardent curlers known. It was a standing joke that when some one telephoned for Dr. Atherton when he was engaged in the game he was always "too busy for an hour or more" to attend unless it was a case of extreme importance. He was very fond of children and often expressed disappointment that he and his wife had been deprived of them. His wife was a Miss Wiley, a native of Fredericton.

In politics he was an ardent Liberal, and a great admirer of the then Premier Sir Wilfrid Laurier. In fact, he was persuaded in 1911 to accept nomination for the Federal House, and was making splendid progress in his canvass when he made a psychological misadventure of the worst kind for himself and the best for his opponent. It was during the election for Reciprocity with the United States. Senator Champ Clark in a speech in Congress at Washington was quoted as having threatened the annexation of Canada by the United States. While Dr. Atherton was making an address before a body of electors, he was interrupted by a heckler who shouted "What about annexation and the Stars and Stripes?" To which he in his impulsive manner replied "What's wrong with the American flag? I'd as soon live under it as any other." This undoubtedly contributed largely to his defeat, for at that time Champ Clark with his propaganda was heartily abhorred by the loyal Canadian, nothing more offensive could possibly have occurred to raise the passions of the voter and to have incited action in behalf of his opponent (which gentle man won out by a large majority).

In his day the automobile was not much in use here and no one outstripped Dr. Atherton in his turnouts. He was a great lover of horses, and drove a span well mated and with lots of style. He would not tolerate a poor horse. To see him in his winter turnout was quite a picture, with flowing fur robes, beaver fur coat, black peaked fur cap, grey beard, heavy fur mits, and beautifully harnessed animals.

Dr. Atherton was one of the pioneers in surgery, having done some very advanced work. He attained quite a reputation throughout Canada and the United States. When he left Fredericton for California a group of us tendered him a dinner and presented him with a memento of our regard for him which visibly affected him. It was apparent then that he had about reached his limit physically. He lived in San Diego, California, from 1916 to the time of his death in 1921, at the age of 78 years, when he suffered a cerebral hæmorrhage.

W H IRVINE

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

BY ALFRED BROWN M.D. F.R.C.S. OMAHA

THE SURGERY OF JOHN ARDERNE

DURING the later years of the Middle Ages surgery was gradually passing northward through Europe. The returning crusaders had brought with them from the orient the surgical practices of the Arabian school and Salerno followed shortly by Padua and Bologna had become the starting point of surgical teaching. Thence it spread northward and the universities at Montpellier and Paris were founded and with these the non-clerical College de St. Cosme where Lanfrancus of Milan after having been refused a place in the University at Paris taught the surgery which he had learned in southern Europe. It was only natural that the northward and westward march of the new medicine and surgery should continue and the foundation of the University of Oxford in England was the logical outcome. Gilbertus Anglicus and John of Gaddesden the latter professor of medicine at Oxford taught and wrote of medicine and included surgery but their surgical work was little more than a compilation of that of the early Greeks with a smattering of the later Arabian and England in contradistinction to Italy with Lanfrancus and France with its numerous surgeons the most outstanding of whom was Henri de Mondeville had furnished no great surgeon. Then to fill this vacancy and head a list of illustrious Englishmen came John Arderne. He was born just after the last crusade in 1307. Where he received his preliminary education we do not know nor does he tell us where he was trained in medicine. His preliminary education was good for he wrote his surgeries in Latin which for medical Latin is excellent. That he received the complete medical training of the day we may infer from the fact that he describes himself as *Chirurgicus inter Medicos* surgeon among physicians which appears to mean that he became a physician with all the rights and privileges which that meant and then of his own volition studied and practiced surgery. In 1346 we find him serving as sergeant surgeon in the army which shipped to France in 1346 by Edward the Third acquitted itself so well at Crecy. Here he obtained experience in the treatment of wounds. Upon his return he settled in Wiltshire and was there when the Black Death swept England in 1368. The following year when 42 years of age he moved to Newark in Nottinghamshire and his name became inseparably connected with this loca-

tion for he is usually referred to as John Arderne of Newark. He did not however remain in Newark for after having built up a great reputation as a surgeon and after having obtained a large practice he moved to London in 1370 and there so far as is known spent the remainder of his life.

Arderne's works have never been completely translated and printed. Some of the manuscripts have been made available however, and all show that he made his chief life work the study of the treatment of fistulae in various parts of the body and especially fistula *in ano*. One of the manuscripts not written by him but entitled *The Practice of Master John Arderne of Newark in the Art of Medicine and Surgery* is dated 1412 and is in the library at Stockholm Sweden. A photographic replica was made by the Wellcome Historical Museum. It was transcribed by Eric Millar, translated by Sir D. Arcy Power and published by William Wood & Company New York in 1922. The illustration here shown is a reproduction of one of the pages in that publication and reveals an entirely new departure in surgical teaching the application of the visual method. Anatomy and obstetrics had been illustrated previously and in the work of the Arabians illustrations of instruments had been shown but this man illustrated the surgical lesion and endeavored to teach by visualization of the living pathology itself. This method as surgical teaching has gradually advanced has been elaborated until today it is the basis upon which pedagogic methods rest. The discoveries in the allied sciences of physics and electricity have been adapted to our uses today. The microscope, X-ray and electrically lighted instruments of visual precision play a great part in surgical diagnosis. The constant effort has been and is to see the lesion wherever it may be situated and to this man who lived more than five hundred years back we must give the credit of having had the ingenuity to recognize the value of this method of transferring his ideas to others.

Arderne's greatest achievement in operative surgery was the evolution of the radical operation for fistula *in ano*. By means of special instruments he split the tract and laid it wide open. Sometimes he did this with a cutting string which he called *Trenum cesaris* and sometimes with a knife but always the fundamental idea was the same wide opening of the tract and thus he was the originator of the modern operation for fistula *in ano*.

1870-1871
1872-1873
1874-1875
1876-1877
1878-1879
1880-1881
1882-1883
1884-1885
1886-1887
1888-1889
1890-1891
1892-1893
1894-1895
1896-1897
1898-1899
1900-1901
1902-1903
1904-1905
1906-1907
1908-1909
1910-1911
1912-1913
1914-1915
1916-1917
1918-1919
1920-1921
1922-1923
1924-1925
1926-1927
1928-1929
1930-1931
1932-1933
1934-1935
1936-1937
1938-1939
1940-1941
1942-1943
1944-1945
1946-1947
1948-1949
1950-1951
1952-1953
1954-1955
1956-1957
1958-1959
1960-1961
1962-1963
1964-1965
1966-1967
1968-1969
1970-1971
1972-1973
1974-1975
1976-1977
1978-1979
1980-1981
1982-1983
1984-1985
1986-1987
1988-1989
1990-1991
1992-1993
1994-1995
1996-1997
1998-1999
2000-2001
2002-2003
2004-2005
2006-2007
2008-2009
2010-2011
2012-2013
2014-2015
2016-2017
2018-2019
2020-2021
2022-2023
2024-2025
2026-2027
2028-2029
2030-2031
2032-2033
2034-2035
2036-2037
2038-2039
2040-2041
2042-2043
2044-2045
2046-2047
2048-2049
2050-2051
2052-2053
2054-2055
2056-2057
2058-2059
2060-2061
2062-2063
2064-2065
2066-2067
2068-2069
2070-2071
2072-2073
2074-2075
2076-2077
2078-2079
2080-2081
2082-2083
2084-2085
2086-2087
2088-2089
2090-2091
2092-2093
2094-2095
2096-2097
2098-2099
2100-2101
2102-2103
2104-2105
2106-2107
2108-2109
2110-2111
2112-2113
2114-2115
2116-2117
2118-2119
2120-2121
2122-2123
2124-2125
2126-2127
2128-2129
2130-2131
2132-2133
2134-2135
2136-2137
2138-2139
2140-2141
2142-2143
2144-2145
2146-2147
2148-2149
2150-2151
2152-2153
2154-2155
2156-2157
2158-2159
2160-2161
2162-2163
2164-2165
2166-2167
2168-2169
2170-2171
2172-2173
2174-2175
2176-2177
2178-2179
2180-2181
2182-2183
2184-2185
2186-2187
2188-2189
2190-2191
2192-2193
2194-2195
2196-2197
2198-2199
2200-2201
2202-2203
2204-2205
2206-2207
2208-2209
2210-2211
2212-2213
2214-2215
2216-2217
2218-2219
2220-2221
2222-2223
2224-2225
2226-2227
2228-2229
2230-2231
2232-2233
2234-2235
2236-2237
2238-2239
2240-2241
2242-2243
2244-2245
2246-2247
2248-2249
2250-2251
2252-2253
2254-2255
2256-2257
2258-2259
2260-2261
2262-2263
2264-2265
2266-2267
2268-2269
2270-2271
2272-2273
2274-2275
2276-2277
2278-2279
2280-2281
2282-2283
2284-2285
2286-2287
2288-2289
2290-2291
2292-2293
2294-2295
2296-2297
2298-2299
2300-2301
2302-2303
2304-2305
2306-2307
2308-2309
2310-2311
2312-2313
2314-2315
2316-2317
2318-2319
2320-2321
2322-2323
2324-2325
2326-2327
2328-2329
2330-2331
2332-2333
2334-2335
2336-2337
2338-2339
2340-2341
2342-2343
2344-2345
2346-2347
2348-2349
2350-2351
2352-2353
2354-2355
2356-2357
2358-2359
2360-2361
2362-2363
2364-2365
2366-2367
2368-2369
2370-2371
2372-2373
2374-2375
2376-2377
2378-2379
2380-2381
2382-2383
2384-2385
2386-2387
2388-2389
2390-2391
2392-2393
2394-2395
2396-2397
2398-2399
2400-2401
2402-2403
2404-2405
2406-2407
2408-2409
2410-2411
2412-2413
2414-2415
2416-2417
2418-2419
2420-2421
2422-2423
2424-2425
2426-2427
2428-2429
2430-2431
2432-2433
2434-2435
2436-2437
2438-2439
2440-2441
2442-2443
2444-2445
2446-2447
2448-2449
2450-2451
2452-2453
2454-2455
2456-2457
2458-2459
2460-2461
2462-2463
2464-2465
2466-2467
2468-2469
2470-2471
2472-2473
2474-2475
2476-2477
2478-2479
2480-2481
2482-2483
2484-2485
2486-2487
2488-2489
2490-2491
2492-2493
2494-2495
2496-2497
2498-2499
2500-2501
2502-2503
2504-2505
2506-2507
2508-2509
2510-2511
2512-2513
2514-2515
2516-2517
2518-2519
2520-2521
2522-2523
2524-2525
2526-2527
2528-2529
2530-2531
2532-2533
2534-2535
2536-2537
2538-2539
2540-2541
2542-2543
2544-2545
2546-2547
2548-2549
2550-2551
2552-2553
2554-2555
2556-2557
2558-2559
2560-2561
2562-2563
2564-2565
2566-2567
2568-2569
2570-2571
2572-2573
2574-2575
2576-2577
2578-2579
2580-2581
2582-2583
2584-2585
2586-2587
2588-2589
2590-2591
2592-2593
2594-2595
2596-2597
2598-2599
2600-2601
2602-2603
2604-2605
2606-2607
2608-2609
2610-2611
2612-2613
26

[illegible][illegible]

[Faint handwritten notes from another page are visible through the paper.]

[illegible]

1. *Ammonia* - 100 ml
 2. *Ammonia* - 100 ml
 3. *Ammonia* - 100 ml
 4. *Ammonia* - 100 ml
 5. *Ammonia* - 100 ml
 6. *Ammonia* - 100 ml
 7. *Ammonia* - 100 ml
 8. *Ammonia* - 100 ml
 9. *Ammonia* - 100 ml
 10. *Ammonia* - 100 ml
 11. *Ammonia* - 100 ml
 12. *Ammonia* - 100 ml
 13. *Ammonia* - 100 ml
 14. *Ammonia* - 100 ml
 15. *Ammonia* - 100 ml
 16. *Ammonia* - 100 ml
 17. *Ammonia* - 100 ml
 18. *Ammonia* - 100 ml
 19. *Ammonia* - 100 ml
 20. *Ammonia* - 100 ml
 21. *Ammonia* - 100 ml
 22. *Ammonia* - 100 ml
 23. *Ammonia* - 100 ml
 24. *Ammonia* - 100 ml
 25. *Ammonia* - 100 ml
 26. *Ammonia* - 100 ml
 27. *Ammonia* - 100 ml
 28. *Ammonia* - 100 ml
 29. *Ammonia* - 100 ml
 30. *Ammonia* - 100 ml
 31. *Ammonia* - 100 ml
 32. *Ammonia* - 100 ml
 33. *Ammonia* - 100 ml
 34. *Ammonia* - 100 ml
 35. *Ammonia* - 100 ml
 36. *Ammonia* - 100 ml
 37. *Ammonia* - 100 ml
 38. *Ammonia* - 100 ml
 39. *Ammonia* - 100 ml
 40. *Ammonia* - 100 ml
 41. *Ammonia* - 100 ml
 42. *Ammonia* - 100 ml
 43. *Ammonia* - 100 ml
 44. *Ammonia* - 100 ml
 45. *Ammonia* - 100 ml
 46. *Ammonia* - 100 ml
 47. *Ammonia* - 100 ml
 48. *Ammonia* - 100 ml
 49. *Ammonia* - 100 ml
 50. *Ammonia* - 100 ml
 51. *Ammonia* - 100 ml
 52. *Ammonia* - 100 ml
 53. *Ammonia* - 100 ml
 54. *Ammonia* - 100 ml
 55. *Ammonia* - 100 ml
 56. *Ammonia* - 100 ml
 57. *Ammonia* - 100 ml
 58. *Ammonia* - 100 ml
 59. *Ammonia* - 100 ml
 60. *Ammonia* - 100 ml
 61. *Ammonia* - 100 ml
 62. *Ammonia* - 100 ml
 63. *Ammonia* - 100 ml
 64. *Ammonia* - 100 ml
 65. *Ammonia* - 100 ml
 66. *Ammonia* - 100 ml
 67. *Ammonia* - 100 ml
 68. *Ammonia* - 100 ml
 69. *Ammonia* - 100 ml
 70. *Ammonia* - 100 ml
 71. *Ammonia* - 100 ml
 72. *Ammonia* - 100 ml
 73. *Ammonia* - 100 ml
 74. *Ammonia* - 100 ml
 75. *Ammonia* - 100 ml
 76. *Ammonia* - 100 ml
 77. *Ammonia* - 100 ml
 78. *Ammonia* - 100 ml
 79. *Ammonia* - 100 ml
 80. *Ammonia* - 100 ml
 81. *Ammonia* - 100 ml
 82. *Ammonia* - 100 ml
 83. *Ammonia* - 100 ml
 84. *Ammonia* - 100 ml
 85. *Ammonia* - 100 ml
 86. *Ammonia* - 100 ml
 87. *Ammonia* - 100 ml
 88. *Ammonia* - 100 ml
 89. *Ammonia* - 100 ml
 90. *Ammonia* - 100 ml
 91. *Ammonia* - 100 ml
 92. *Ammonia* - 100 ml
 93. *Ammonia* - 100 ml
 94. *Ammonia* - 100 ml
 95. *Ammonia* - 100 ml
 96. *Ammonia* - 100 ml
 97. *Ammonia* - 100 ml
 98. *Ammonia* - 100 ml
 99. *Ammonia* - 100 ml
 100. *Ammonia* - 100 ml

[illegible]

187
 188
 189
 190
 191
 192
 193
 194
 195
 196
 197
 198
 199
 200
 201
 202
 203
 204
 205
 206
 207
 208
 209
 210
 211
 212
 213
 214
 215
 216
 217
 218
 219
 220
 221
 222
 223
 224
 225
 226
 227
 228
 229
 230
 231
 232
 233
 234
 235
 236
 237
 238
 239
 240
 241
 242
 243
 244
 245
 246
 247
 248
 249
 250
 251
 252
 253
 254
 255
 256
 257
 258
 259
 260
 261
 262
 263
 264
 265
 266
 267
 268
 269
 270
 271
 272
 273
 274
 275
 276
 277
 278
 279
 280
 281
 282
 283
 284
 285
 286
 287
 288
 289
 290
 291
 292
 293
 294
 295
 296
 297
 298
 299
 300
 301
 302
 303
 304
 305
 306
 307
 308
 309
 310
 311
 312
 313
 314
 315
 316
 317
 318
 319
 320
 321
 322
 323
 324
 325
 326
 327
 328
 329
 330
 331
 332
 333
 334
 335
 336
 337
 338
 339
 340
 341
 342
 343
 344
 345
 346
 347
 348
 349
 350
 351
 352
 353
 354
 355
 356
 357
 358
 359
 360
 361
 362
 363
 364
 365
 366
 367
 368
 369
 370
 371
 372
 373
 374
 375
 376
 377
 378
 379
 380
 381
 382
 383
 384
 385
 386
 387
 388
 389
 390
 391
 392
 393
 394
 395
 396
 397
 398
 399
 400
 401
 402
 403
 404
 405
 406
 407
 408
 409
 410
 411
 412
 413
 414
 415
 416
 417
 418
 419
 420
 421
 422
 423
 424
 425
 426
 427
 428
 429
 430
 431
 432
 433
 434
 435
 436
 437
 438
 439
 440
 441
 442
 443
 444
 445
 446
 447
 448
 449
 450
 451
 452
 453
 454
 455
 456
 457
 458
 459
 460
 461
 462
 463
 464
 465
 466
 467
 468
 469
 470
 471
 472
 473
 474
 475
 476
 477
 478
 479
 480
 481
 482
 483
 484
 485
 486
 487
 488
 489
 490
 491
 492
 493
 494
 495
 496
 497
 498
 499
 500
 501
 502
 503
 504
 505
 506
 507
 508
 509
 510
 511
 512
 513
 514
 515
 516
 517
 518
 519
 520
 521
 522
 523
 524
 525
 526
 527
 528
 529
 530
 531
 532
 533
 534
 535
 536
 537
 538
 539
 540
 541
 542
 543
 544
 545
 546
 547
 548
 549
 550
 551
 552
 553
 554
 555
 556
 557
 558
 559
 560
 561
 562
 563
 564
 565
 566
 567
 568
 569
 570
 571
 572
 573
 574
 575
 576
 577
 578
 579
 580
 581
 582
 583
 584
 585
 586
 587
 588
 589
 590
 591
 592
 593
 594
 595
 596
 597
 598
 599
 600
 601
 602
 603
 604
 605
 606
 607
 608
 609
 610
 611
 612
 613
 614
 615
 616
 617
 618
 619
 620
 621
 622
 623
 624
 625
 626
 627
 628
 629
 630
 631
 632
 633
 634
 635
 636
 637
 638
 639
 640
 641
 642
 643
 644
 645
 646
 647
 648
 649
 650
 651
 652
 653
 654
 655
 656
 657
 658
 659
 660
 661
 662
 663
 664
 665
 666
 667
 668
 669
 670
 671
 672
 673
 674
 675
 676
 677
 678
 679
 680
 681
 682
 683
 684
 685
 686
 687
 688
 689
 690
 691
 692
 693
 694
 695
 696
 697
 698

[illegible]

120 a (1000) 1000
120 a (1000) 1000
120 a (1000) 1000
120 a (1000) 1000



THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED BROWN M.D. F.R.C.S. OXFORD

THE SURGERY OF JOHN ARDERNE

DURING the later years of the Middle Ages surgery was gradually passing northward through Europe. The returning crusaders had brought with them from the orient the surgical practices of the Arabian school and Salerno followed shortly by Padua and Bologna had become the starting point of surgical teaching. Thence it spread northward and the universities at Montpellier and Paris were founded and with these the non clerical College de St Cosme where Lanfrancus of Milan after having been refused a place in the University at Paris taught the surgery which he had learned in southern Europe. It was only natural that the northward and westward march of the new medicine and surgery should continue and the foundation of the University of Oxford in England was the logical outcome. Gilbertus Anglicus and John of Gaddesden the latter professor of medicine at Oxford taught and wrote of medicine and included surgery but their surgical work was little more than a compilation of that of the early Greeks with a smattering of the later Arabian and England in contradistinction to Italy with Lanfrancus and France with its numerous surgeons the most outstanding of whom was Henri de Mondeville had furnished no great surgeon. Then to fill this vacancy and head a list of illustrious Englishmen came John Arderne. He was born just after the last crusade in 1307. Where he received his preliminary education we do not know nor does he tell us where he was trained in medicine. His preliminary education was good for he wrote his surgeries in Latin which for medical Latin is excellent. That he received the complete medical training of the day we may infer from the fact that he describes himself as *Chirurgicus inter Medicos* surgeon among physicians which appears to mean that he became a physician with all the rights and privileges which that meant and then of his own volition studied and practiced surgery. In 1346 we find him serving as sergeant surgeon in the army which shipped to France in 1346 by Edward the Third acquitted itself so well at Crecy. Here he obtained experience in the treatment of wounds. Upon his return he settled in Wiltshire and was there when the Black Death swept England in 1368. The following year when 42 years of age he moved to Newark in Nottinghamshire and his name became inseparably connected with this loca-

tion for he is usually referred to as John Arderne of Newark. He did not however remain in Newark for after having built up a great reputation as a surgeon and after having obtained a large practice he moved to London in 1370, and there so far as is known spent the remainder of his life.

Arderne's works have never been completely translated and printed. Some of the manuscripts have been made available however and all show that he made his chief life work the study of the treatment of fistula in various parts of the body and especially fistula in ano. One of the manuscripts not written by him, but entitled 'The Practice of Master John Arderne of Newark in the Art of Medicine and Surgery' is dated 1412, and is in the library at Stockholm Sweden. A photographic replica was made by the Wellcome Historical Museum. It was translated by Eric Millar, translated by Sir D. Arcy Power and published by William Wood & Company New York in 1922. The illustration here shown is a reproduction of one of the pages in that publication and reveals an entirely new departure in surgical teaching the application of the visual method. Anatomy and obstetrics had been illustrated previously and in the work of the Arabians illustrations of instruments had been shown but this man illustrated the surgical lesion and endeavored to teach by visualization of the living pathology itself. This method as surgical teaching has gradually advanced has been elaborated until today it is the basis upon which pedagogic methods rest. The discoveries in the allied sciences of physics and electricity have been adapted to our uses today. The microscope, x-ray and electrically lighted instruments of visual precision play a great part in surgical diagnosis. The constant effort has been and is to see the lesion wherever it may be situated and to this man who lived more than five hundred years back we must give the credit of having had the ingenuity to recognize the value of this method of transferring his ideas to others.

Arderne's greatest achievement in operative surgery was the evolution of the radical operation for fistula in ano. By means of special instruments he split the tract and laid it wide open. Sometimes he did this with a cutting string which he called *Frenum cesaris* and sometimes with a knife but always the fundamental idea was the same wide opening of the tract and thus he was the originator of the modern operation for fistula in ano.

All the minor details of the operation are omitted, only the underlying surgical principles are mentioned. In dealing with prognosis the authors have been guided by their own results and those of others, tables of actual statistics, however, have been avoided. The authors have carried out their plans in a most excellent manner. Their reasoning is clear and logical and their advice sound, sane, and conservative.

The book is to be highly recommended to the general practitioner and the internist. It will tell them what the surgeon can do for them, what results they have a right to expect, and in a general way what procedures will be carried out. The surgeon will be intensely interested in this work as a study in surgical judgment.

The reviewer hopes that volumes I and II will reach the same high standard as volume III.

R. B. BETTMAN

PHYSIOLOGY has influenced continuously scientific surgical investigation. While bone has undergone innumerable histological and experimental investigations it is only gradually that histological study of specific cells to which the virtue of bone formation or against which the failure of bone formation in any given instance could be laid, has been influenced by general physiological principles.

In the preface of their small monograph on bone¹ Leriche and Policard explain the book by saying that after 10 years' observation of the multiple aspects of normal and pathological evolution of bone, they have gradually felt thrust upon themselves a new understanding of the development, the life and the evolution, the diseases and the methods of regeneration of osseous tissue.

In regard to osteogenesis, a mass of observations and experiences has been accumulated which in place of simplifying the questions has rendered them more complex. The problems of osteogenesis have passed through many stages—they were histological, then surgical, and finally have now become chemical. The authors believe it is useless for histologists to hash and re hash their old disputes or for the surgeon to continue experiments on the periosteum, bone grafts or the osteogenesis of repair. Chemistry alone offers new facts in bone physiology and pathology.

Bone formation is regarded as a metaplasia of fibrous tissue first rendered embryonic, divided into the following phases:

(1) Fibrous tissue becomes cedematous and tends to revert to an embryonic type. (2) In the connective tissue thus formed there is a special pre-osseous infiltration. (3) This pre-osseous substance is impregnated with calcium salts and becomes hard. Bone is then formed. These points are then taken to explain all physiological and pathological changes in bone.

Any student of bone changes will enjoy reading these pages.

KELLOGG SPEED

¹LES PROBLÈMES DE LA PHYSIOLOGIE NORMALE ET PATHOLOGIQUE DE L'OS. By R. Leriche and A. Policard. Paris: Masson et Cie 1926.

AFTER an historical review of the subject of gastroscopy,² Rachet sets forth his reasons for the use of the straight gastroscope on a metal thread guide guarded by a bulbar tip. Gastroscopy is reserved for certain cases in which diagnosis can not be made by other clinical methods and is used to replace exploratory laparotomy. The methods of examination are given in detail.

Local anesthesia preceded by a hypodermic injection of a sedative is always used. A 10 per cent solution of cocaine is painted on the pharynx just before the tube is inserted. The anesthesia includes the pharyngeal fossae, the posterior wall of the pharynx, the base of the tongue, and the superior orifice of the esophagus. After the anesthesia has obliterated the pharyngeal reflex the metal wire guide must be swallowed. The left lateral position is the best one for introducing the gastroscope but the knee chest position is the best for the progress of the instrument toward the stomach.

The problems of vision and orientation once the stomach is entered, are then discussed, followed by descriptions of the normal gastric mucosa in the different segments of the stomach as seen through the gastroscope. Finally, the findings in the different pathological conditions of the stomach are discussed.

This small monograph covers completely and minutely the whole subject and becomes indispensable to anyone attempting this method of stomach examination.

KELLOGG SPEED

A MONOGRAPH by Wassermann³ based on 5 years of clinical observation ably presents the newer clinical viewpoints concerning cardiac asthma. It is emphasized that asthmatic attacks occur in left heart as well as in right heart insufficiency. Functional insufficiency of the left ventricle produces asthma by affecting the arterial and the central nervous system.

WALTER NADLER

THE joy of working in the virgin field of the wrist was Destot's. In 1898 he began his study of the complicated arrangement of the carpus and its injuries and many articles and one small monograph came from his pen. A radiological study⁴ was practically finished before his death, and now after a too long period has finally come from the press edited by some of his pupils.

About the carpus and its injuries very little is known by the average surgeon and still less by the practitioner. The subject is extremely complicated and although Destot spent 20 years in observation of this area and while he came to understand the fractures well he apparently did not grasp completely the full pathology or radiology of the various dislocations. This volume is an important contribution.

²LA GASTROSCOPIE. ÉTUDE CLINIQUE ET EXPÉRIMENTALE. By Docteur Jean Rachet. Paris: Gaston Doin & Cie 1926.

³NEUE KLINISCHE GESICHTSPUNKTE ZUR LEHRE VON ASTHMA CARDIALE. By Dr. Sigmund Wassermann. Berlin: Urban & Schwarzenberg 1926.

⁴INJURIES OF THE WRIST. A RADIOLOGICAL STUDY. By the late Dr. Étienne Destot. Translated by F. R. B. Atkinson M.D. C.M. (Edin.) New York: Paul B. Hoeber 1926.

to the literature of the carpus, but it will be difficult for many readers easily to get information from it as there is no up-to-date classification of the dislocations. The work on mechanism and pathology of fractures is excellent.

The illustrations could have been better described by words printed on the figures or by longer descriptions aided by figures inserted on the drawing or halftone. The paragraphs on the rarer carpal fractures seem all too brief.

The last part of the book deals with fractures of the lower end of the radius and Colles' fracture which becomes according to the French idea,

Pouteau's fracture. The author recommends the use of plaster-of-Paris splints for from 12 to 15 days in adults, and for from 15 to 20 days in epiphyseal separations of childhood. Rather small space is given to treatment of these fractures.

Dr. Atkinson deserves great credit for his translation from the French.

For the student of carpal injuries this book is invaluable; it will be referred to for years to come. For the average surgeon only close and possibly repeated reading will result in an intelligent application of the material to his own cases.

KELLOGG SPEED

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

DISEASES OF CHILDREN. A SHORT INTRODUCTION TO THEIR STUDY. By Hector Charles Cameron, M.A., M.D. (Cantab.) F.R.C.P. (Lond.). New York, Oxford University Press, 1926.

RADIOTHERAPY IN RELATION TO GENERAL MEDICINE. By Francis Herniman Johnson, M.D. (Aberd.). New York, Oxford University Press, 1926.

SURGERY OF NEOPLASTIC DISEASES BY ELECTROTHERMIC METHODS. By George A. Wyeth, M.D. Preface by Howard A. Kelly, M.D. New York, Paul B. Hoeber, 1926.

THE SURGERY OF GASTRO-DUODENAL ULCERATION. By Charles A. Pannett, B.Sc., M.D. (Lond.) F.R.C.S. (Eng.). New York, Oxford University Press, 1926.

ELECTROTHERMIC METHODS (DESICCATION AND COAGULATION) IN THE TREATMENT OF NEOPLASTIC DISEASES DESIGNED AS A PRACTICAL HANDBOOK OF SURGICAL ELECTROTHERAPY. By J. Douglas Morgan, B.A., M.D. Philadelphia, F. A. Davis Company, 1926.

BRAIN AND HEART. LECTURES ON PHYSIOLOGY. By Giulio Fano. Translated by Helen Ingleby. Foreword by Prof. E. H. Starling, CMG, M.D., D.Sc., F.R.S. New York, Oxford University Press, 1926.

CLÍNICA OBSTÉTRICA. By Dr. Guillermo Liepmann, 4th ed. Translated directly from the German by Dr. Victor Cornil y Montobbio. Barcelona, Salvat Editores, S.A., 1926.

PATHOLOGY AND TREATMENT OF THE INFLAMMATORY DISEASES OF THE NASAL ACCESSORY SINUSES. By Prof. Dr. M. Hajek. Translated and edited by Joseph D. Heister, A.B., M.D. and French K. Hansel, M.D., M.S. 6th ed. vols. 1 and 2. St. Louis, The C. V. Mosby Company, 1926.

A PRACTICAL MEDICAL DICTIONARY. By Thomas Lathrop Stedman, A.M., M.D. 9th rev. ed. New York, William Wood and Company, 1926.

GOULD'S MEDICAL DICTIONARY. By George M. Gould, A.M., M.D. Edited by R. J. L. Scott, M.A., B.C.L., M.D. Philadelphia, P. Blakiston's Son & Company, 1926.

THE INFLAMMATORY AND TOXIC DISEASES OF BONE, A TEXT BOOK FOR SENIOR STUDENTS. By R. Lawford Knaggs, M.C. (Cantab.) F.R.C.S. New York, William Wood and Company, 1926.

GOUT AND OTHER DISEASES OF THE THYROID GLAND. By Arnold S. Jackson, M.D. New York, Paul B. Hoeber, 1926.

ANALES DEL SANATORIO VALDES vol. 11. Mexico, Boulogny & Schmidt, Suer, 1926.

THE MODERN TREATMENT OF HEMORRHOIDS. By Joseph Franklin Montague, M.D., F.A.C.S. Foreword by Harlow Brooks, M.D., F.A.C.P. Philadelphia, J. B. Lippincott Co., 1926.

THE X-RAY IN EMBRYOLOGY AND OBSTETRICS. By W. A. Newman Dorland, A.M., M.D., F.A.C.S. and Mamillian John Hubeny, M.D., F.A.C.R., F.A.C.P. St. Paul, Bruce Publishing Company, 1926.

ORTHOPEDIC SURGERY. By W. A. Cochrane, M.B., Ch.B., F.R.C.S.E. New York, William Wood & Company, 1926.

PHYSICAL THERAPY IN DISEASES OF THE EYE, EAR, NOSE AND THROAT. With chapters on some borderline affections. By Abraham R. Hollender, M.D. and Maurice H. Cottle, M.D. New York, The Macmillan Company, 1926.

UEBER DIE STRUKTUR IN DEN CORPUS LUTEUM ZELLEN DES MENSCHEN UND IHRE VERÄNDERUNGEN WAHREND DES MENSTRUATIONSZYKLUS UND BEI GRAVIDITÄT. By J. J. Chydenius, Jena, Gustav Fischer, 1926.

THE DUODENAL TUBE AND ITS POSSIBILITIES. By Max Einhorn, M.D. 2d ed. Philadelphia, F. A. Davis Company, 1926.

AN ATLAS OF MIDWIFERY. By Comyns Berkeley, M.A., M.C., M.D. (Cantab.) F.R.C.P. (Lond.) M.A.C.S. (Eng.) and Georges M. Dupuy, M.D. New York, William Wood and Company, 1926.

THE TREATMENT OF FRACTURES WITH NOTE UPON A FEW COMMON DISLOCATIONS. By Charles Locke Scudder, A.B., Ph.B., M.D., F.A.C.S. 10th ed. rev. Philadelphia, W. R. Saunders, 1926.

MATERNAL MORTALITY. THE RISK OF DEATH IN CHILD BIRTH AND FROM ALL DISEASES CAUSED BY PREGNANCY AND CONFINEMENT. By Robert Morse Woodbury, Ph.D. Washington, Government Printing Office, 1926.

PLASTIC SURGERY OF THE HEAD, FACE AND NECK. By H. Lyons Hunt, M.D., L.R.C.S. (Edin.) Philadelphia, Lea & Febiger, 1926.

METHODS AND PROBLEMS OF MEDICAL EDUCATION. 5th series. New York, The Rockefeller Foundation, 1926.

A PRACTICE OF PHYSIOTHERAPY. By C. M. Sampson, M.D. The C. V. Mosby Company, 1926.

AMERICAN COLLEGE OF SURGEONS

SIR WILLIAM MACEWEN AND THE GLASGOW SCHOOL OF SURGERY¹

By ARCHIBALD YOUNG

Regius Professor of Surgery in the University of Glasgow

IT is, indeed, a signal honor to be called upon to deliver this Oration, the purpose of which is to keep green in all our hearts the memory of that great man, who had so much to do with the origination of the movement that led to the foundation of the American College of Surgeons. I regret that my capacity for adequate fulfilment of the task is not equal to my desire to do it justice. If I fail in the attempt it shall not be from lack of appreciation nor from overconfidence.

It is not the purpose of your annual oration as I conceive it, that it should take the form of a mere panegyric on John B. Murphy, the man, or John B. Murphy, the surgeon, nor even that it should deal exclusively, or perhaps at all, with his great contributions to modern surgery. Were it the former, then, except as an entire outsider, I could not dare assume the task that has been given me.

It would indeed savor of presumption were I, who never saw your great surgical Hero, who never heard his voice, who had no near hand experience of his personal influence, to speak, to you of Murphy, the man, or even of Murphy, the teacher of his Art. If I knew him at all, it was most surely by his work. And yet, to one who has read, as I have done, that wonderful Memorial Oration which formed the first of this series, delivered by Sir Berkeley Moynihan in this City in 1920, it almost seems as if the great man stood forth so plainly that his lineaments, his speech, his methods of teaching, his habits of thought were familiar as those of an old acquaintance, a well tried friend (37).

Sir St. Clair Thomson, in an address delivered in the College of Physicians, Philadelphia, on June 14, 1919, entitled "A House Surgeon's Memories of Joseph Lister" quoted from Brownning the following lines, they are supposed to be spoken to a friend who had actually met, and talked with Shelley.

And did you once see Shelley plain
And did he stop and speak to you
And did you speak to him again?
How strange it seems and new! (43)

Thomson quoted the lines as suggesting to him the duty devolving on those, still surviving, who once had the great privilege of "seeing Lister plain," to put on record, for the benefit of those not so fortunate, such personal recollections and impressions as they can of that great man.

In that wonderful word picture of him, depicting John B. Murphy the center of an all absorbing interest in his lecture theater, Moynihan has drawn a picture of Murphy as one of the greatest clinical teachers of the world, and has drawn it with a warmth of color that seems to me to stamp upon one's heart the very character of the man whom he paints. It must have helped many, as it has certainly helped me to "see John B. Murphy plain."

But, if I may be permitted a few words about the great work of John B. Murphy, I should like to emphasize one aspect only of his almost priceless contributions to our common Art. Your earlier orators, Moynihan, William J. Mayo, Bastianelli, Crile, and Lane, as well as numerous other writers, have dwelt on most of the subjects in which Murphy's teaching has left its impress very deeply on the Science and Art of Surgery. Murphy's shutoff, his intestinal clamps, his method of treatment of abscesses, his work on the treatment of ankylosis of the larger joints, on the production of artificial pneumothorax, on the repair of peripheral nerves. Perhaps none has dwelt sufficiently on the aspect of his work that has always appealed to me most, both from the point of view of its intrinsic value and as representing an advance of almost inestimable worth to the whole human race, I refer to Murphy's contribution to the proper understanding of the vital potentialities of the peritoneum, and to the treatment of peritonitis. May I present to you, in brief illustration, a picture of the state of things as they were, say, 25 to 30 years ago, in respect of the treatment of such a common surgical emergency as perforation of the stomach or of the duodenum, and contrast that picture with present day experience. A simple illustration is always worth a lot of theory.

¹ The John B. Murphy Oration delivered before the Clinical Congress of the American College of Surgeons Montreal October 25, 1926

Almost 30 years ago during my senior student days, and for several years later—during my terms of office as house surgeon, and after—a patient with such a perforation was regarded as almost doomed to speedy death. He or she reached hospital it is true, often late, when toxæmia was far advanced, but whether early or late what was the usual course of events? Operation was carried out if carried out at all, with the patient in a state of profound collapse. It was nearly always a prolonged operation in which the abdomen was laid freely open, the perforation was sought for and sometimes found in which much valuable time was consumed in the attempt to close the opening in the viscus and more time was taken up in laboriously clearing away protective lymph. Most if not all, of the abdominal viscera were turned out on the front of the abdomen, in the process and thereafter a further period of time was consumed by the most pains taking irrigation of the whole peritoneal cavity with saline solution or weak antiseptic lotion. Then the patient if still surviving—and not a few died on the table or were hurried back to bed with the operation only part completed—was slowly and carefully stitched up again and was returned to bed in a state of profounder collapse than ever. What happened next? The patient was placed in bed, without any pillow or with only a very low pillow, and the lower end of the bed was elevated so as to still further depress the shoulders and head and such restoratives as seemed appropriate were applied. The almost invariable sequel was that the pulse failed still further with greater or less rapidity, and presently became quite imperceptible, the whole body became covered with a clammy sweat and death soon ended the scene. There was seldom any expectation of recovery. And I can well remember what a sensation was caused, in the hospital in which I was then a resident when it was noised abroad that a certain patient seemed to show indications of possible recovery, and the greater sensation when such recovery became actually an accomplished fact.

Note the contrast today. The whole scene is changed. We look for recovery not for death and we are disappointed not to say surprised if recovery does not take place.

It is matter of common knowledge that such occurrences as perforation of stomach or duodenum are among the ordinary emergencies of present day surgical practice. They do not now depress us as they did before. I could cite numerous instances in illustration of the change in our experience. Take only one. It is sufficiently illustrative.

Quite recently, we received into my wards in one day, 3 patients with duodenal perforation. All were bad cases. All three were operated on, as it happens by my assistants. Though extremely ill on admission not one of them ever looked like dying. All three made good recoveries. And this may be taken as typical of what we have come to regard as almost the normal.

To whom do we owe such a change? Very largely to the work and teaching of John B. Murphy and his co-workers but to Murphy chiefly. He it was who taught us to deal expeditiously with the initial lesion to shorten the operation as much as possible, 'quick in quick out' to disturb as little as possible the lymph that represents nature's attempt at protection, to abandon the laborious flushing of the peritoneum to trust rather, to its protective recuperative powers to provide if required simple drainage at the most dependent part to make the pelvic peritoneum the most dependent part by raising the patient in bed, to sit him up in fact, and not the opposite, to call in the aid of gravity, so as to concentrate infection in the pelvis, the least dangerous part and to lead it away from the highly absorbent and dangerous area under the diaphragm,—in fact, to do almost everything we had not been doing and to do the very opposite of what we had been doing. He taught us to encourage the reversal of the lymph stream by administering continuously or at short regular intervals, large quantities of normal saline given *per rectum* so to convert the peritoneum, from a mere absorbent into a secreting or excreting organ and encourage elimination.

Surely seldom has there been so complete a reversal of teaching and of practice! Today after an operation for perforation of stomach or duodenum it is quite a common experience to find within 2 or 3 hours, a complete change in the whole clinical picture—pain gone, general comfort, the anxious facies replaced by a look of quiet content, the rapid thready pulse replaced by a quiet measured beat, normal or almost normal temperature and instead of a patient writhing in agony, one who reclining at ease or even sitting bolt upright against his pillows, is ready to give what help he can—and it is much—to counter the still potent possibilities of the disease.

It requires very little reflection to bring home to any one what a revolution the new principles have brought about. Those of us who lived and worked through the transition period realize it most, and remember it applies to all forms of peritoneal infective lesion. Think what a saving in human suffering, what a saving in human lives!

Even as we assess Lister's great discovery, to some extent, in terms of its saving in human suffering and human life, so, also, should we appraise the value of John B. Murphy's teaching in respect of peritonitis and its treatment by surgical means. For this great life saving work, alone, he deserves well of all humanity, and we, his humble disciples, do homage to his great memory.

Having paid, I hope in no perfunctory manner, my tribute to the memory of one great man of our day and generation, I crave your attention for a little longer while I endeavor to appraise for you the life and work of another great man, who, like John B. Murphy, shall surely have a prominent and honorable place in that "Great Procession" of which Sir Berkeley Moynihan spoke in his Memorial Oration in 1920. I refer to my great predecessor in the Regius Chair of Surgery in the University of Glasgow, Sir William Macewen. I would that I could hope to enable this great audience to "See Macewen plain." If, in some measure, I am able to succeed in this endeavor I shall be happy indeed.

I am going to ask your permission, however, to say a little about the School of Surgery in Glasgow where Macewen's life work was done.

In connection with what I have termed the Glasgow School of Surgery, I propose to speak almost exclusively of the course of surgical development and teaching in Glasgow during the period which has elapsed since the institution of the Regius Chair of Surgery in the University of Glasgow in 1815, i. e., 111 years ago, and indeed, to speak of it, as one naturally does, in terms of the successive occupants of the Chair. That is not to say that, apart from the Regius Chair of Surgery at the University, surgery in Glasgow did not exist. Indeed, it would be far from the truth to say, or to imply, any such thing. But it is a convenient way of expressing, in terms of the famous men who have, in their day and generation, been called to that high office, the general progress of events surgical during the period under review. But you will pardon me, if, for a few moments, I take you even further back, and make brief reference to one whose name we in Glasgow cherish still, though he has been gathered to his fathers now for more than 300 years, one, too, whose name and fame are probably as well known to many of you as to myself—Maister Peter Lowe.

THE GLASGOW SCHOOL OF SURGERY

MAISTER PETER LOWE

In the spring of the year 1598, there returned from France, to Glasgow, probably his native city, Maister Peter Lowe. This great man of his

day, had seen service as "Chirurgian major to the Spanish Regiments at Paris," had followed the "French King, my Master in the warres 6 yeeres," where he "tooke commoditie to practise all points and operations of Chirurgerie." He was a contemporary, possibly an acquaintance, of Ambrose Pare, and, indeed, in his published works and in his teaching, he made use of not a few of Pare's illustrations, and adopted and recommended Pare's use of the ligature. Like Pare, though probably by other means, he escaped the perils of the Massacre of St. Bartholomew.

Settling in Glasgow, Maister Peter Lowe soon became so impressed with the unsatisfactory state of things medical and surgical there that he set himself to procure from the King such powers as were necessary to put them right. He sought to obtain from King James the Sixth a charter which should enable him to found some statutory body or College, after the fashion of his own College in Paris. He must surely have had remarkably persuasive powers, or very direct access to the throne, for, within a year and a half of his return to Glasgow, the charter was in his possession, "Written to the Privie Seel, Penult November, 1599." Under this charter was founded, in the year 1602,—the delay of a little over two years is explained by the fact that Lowe had gone to France with the embassy of the Duke of Lennox—the Faculty (now the Royal Faculty) of Physicians and Surgeons of Glasgow. Amongst other provisions of the charter, power was given to Maister Peter Lowe, and a Mr. Robert Hamilton, and their successors, to "summond and convene" "all personis professing or using the said art of Chirurgie, to examine thame upon thair literature, knowledge and practize gif they be fund wordie to admit, allow and approve thame, give thame testimonia according to the art and knowledge." Other provisions were concerned with the proper regulation of the sale of drugs, the supervision of the sale of poisons, and with certain medico-legal functions. The seventh provision of the charter was to the effect that "the saidis visitours, with thair bretherene and successours, sall convene every first Monoday of ilk moneth at sum convenient place, to visite and give counsell to pure disaisit folkis gratis." The Royal Faculty founded under this Charter still exists, still (though now in association with the Royal Colleges in Edinburgh) grants licences to practice, after examinations held sometimes in Glasgow sometimes in Edinburgh, still grants higher qualifications in medicine and in surgery, still appoints annually an inspector of drugs. And, at its statutory monthly meetings, the minutes

regularly end with the words—"The poor were visited gratis, and the Faculty adjourned"

It is necessary to remind you, that at the period when the Faculty of Physicians and Surgeons was founded thus by Royal Charter, the University of Glasgow had been in existence already for 150 years but it concerned itself not at all with either the teaching of medicine or surgery. Nor had it any part in the regulation or examining of those who practiced medicine or surgery. It was not till a little over a hundred years later that there was founded in the University a Chair of Medicine (1717) and still another hundred years were to elapse ere was founded the Regius Chair of Surgery.

So that Maister Peter Lowe the founder of the Royal Faculty is surely worthy of honorable mention in any account of the development of surgery in Glasgow.

It will surely be of interest to Fellows of the American College of Surgeons, whose aims, in the foundation of the College 13 years ago were so largely concerned with the higher standards that they wished to see maintained in education, in ethics in honesty industry and in all that connotes humane learning and experience in the wider developments of surgery who set themselves from the first against all ignorant pretenders and quacks, in whatever form and however speciously disguised who have had before them ever the maintenance of the very loftiest ideals in the training of those who shall practice their common Art, and the preservation of the noblest standards in our profession to know how, over 300 hundred years ago Maister Peter Lowe was prompted to seek his famous charter from very similar ideals, and on like grounds.

The late Dr James Finlayson, in his *Account of the Life and Works of Maister Peter Lowe* (8) refers to the fact that Lowe's writings abound with references to all sorts of "abusers" "deceivers" "ignorants," "simple Barbers" "and other ignorant fellows" "Empiricks" &c and he quotes from the preface to the second edition of Lowe's *Chyrurgerie*, dated 1612 the following—

It pleased his Sacred Maestie to heare my complaint about some fowerteene yeeres agoe upon certaine abusers of our Art of diuers sorts and ranks of people whereof we haue good store and all things sayling unthrifits and Idle people doe commonly meddle themselues with our Art who ordinarily doe passe without either tryall or punishment. The matter being considered and the abuse weighed by his Maestie and Honourable counceill thought not to bee tolerated for the which I got a priuiledge under his highnes priue seale to try and examine all men upon the Art of Chyrurgene to discharge & allow in the West parts of Scotland who were worthy or unworthy to profess the same

Were it possible for us to throw ourselves back a little over three hundred years, I am certain that we should all be prepared to support Maister Peter Lowe in his praiseworthy efforts to raise and to uphold the status of our common Profession.

But I would not have you to suppose that Maister Peter Lowe's claim to honor rests exclusively, or even mainly on the stand he took in this direction. As Finlayson says

Peter Lowe's reputation beyond the neighborhood of Glasgow rests chiefly on his work on *Chirurgie* (1597). This seems to have been the first original systematic treatise on the Whole Course of Chirurgie published in the English Language or indeed in any language in this country. Various partial treatises as on syphilis and gunshot wounds had indeed been published in English and Peter Lowe himself had issued during the previous year a little book on the *Spanish Sicknes* but his new work aimed at going over the whole of Surgery which was then rising into great importance as a branch of the healing art so far distinct from medicine.

Further, Lowe published bound up with all the editions of his *Chirurgie*, what was the first English translation of any of the Hippocratic writing *The Presages of Diuine Hippocrates*.

This is not the place nor is there time to refer at length or in detail, to the character of Lowe's published works but it may suffice to say that they were well informed carefully put together, and that even today they are not without interest.

In his *Chirurgie* he deals with aneurism, gunshot wounds, pyæmia, hernia, the treatment of dropsy, the use of the ligature, certain eye diseases, diseases of the ear and teeth &c.

One special reference to Lowe's writing I would wish to make, particularly in view of the criticism sometimes passed upon his work, that it was not founded on personal observation and deduction of his own but represented in great measure accepted authority. The reference has this added interest that it stands as one of the very earliest recognitions of the part played by *contre coup* in cranial injury, and enables me to link Lowe's work with that which was the chief achievement of him who is the main subject of this oration. Sir William MacEwen. Let the following extract from Lowe's *Chirurgie* tell its own tale, and speak for itself.

The fifth kind of fracture is called counterchift that is when the cleft of the bone is in the part opposite to the sore and of all fractures this is the worst and deceaueith most the Chyrurgion. I haue knowne sundry dye in this case chiefly at the battle of Sandlis in Fraunce a valiant Captaine of Paris who had a stroke on the right parietary who notwithstanding of all handling by skilfull Chyrurgions dyed within 20 dayes at which time his Cranium was opened and there was found great quantity of blood under the left parietane with a cleft in the same. (lib vi chap ii p 314)

Maister Peter Lowe was born somewhere about the year 1550. This date is probably fairly accurately determined. The date of his death is not so definitely known, but it seems probable that it was between the years 1612 and 1614. His tomb is in the churchyard of the Glasgow Cathedral, and, since 1834, has been the property of the Faculty of Physicians and Surgeons. It is marked by a simple memorial stone. The inscription on the tombstone is quaint and well worthy of quotation. I therefore reproduce it here in full—

1612
M
P L

JOHN LOW

JAMES LOW

DOCTOR PETER LOW

The Founder of the Faculty of Physicians and Surgeons

Stay Passenger And View This Stone

For Under It Lyes Such A One

Who Cured Many Whill He Lived

Soe Gracious He Noe Man Grieved

Yea When His Phisicks Force Oft Failed

His Pleasant Purpose Then Prevailed

For Of His God HE Got The Grace

To Live In Mirth And Die In Peace

Heaven Hes His Soul His Corps This Stone

Sigh Passenger And Soe Be Gone

AH ME I GRAVELL AM AND DUST

AND TO THE GRAVE DESHEND I MUST

O PAINTED PEACE OF LIV'ING CLAY

MAY BE NOT PROUD OF THY SHORT DAY

THE REGIUS CHAIR OF SURGERY IN THE UNIVERSITY OF GLASGOW

The Regius Chair of Surgery in the University of Glasgow was instituted in the year 1815, so that it has been in existence now for 111 years. In the course of this period there have been, before myself, five occupants of the Chair.

In my inaugural address, at the opening of the winter session October 15 1924 (48), I dealt with some of the Traditions of the Chair to which I had just been appointed, making brief reference to the life and work of my predecessors. I wish to tell you a little about them, referring, at greater length, to my immediate predecessor, Sir William Macewen.

All were distinguished men, who helped, each in varying degree, to establish the high credit of Surgery and of Surgical Teaching in Glasgow—and in Scotland.

JOHN BURNS, M.D. (1815-1849)

The first Regius Professor was John Burns, M.D. He was appointed in 1815, and held office till 1849, i.e., 34 years. Judged by our standards, I fancy you will think his period of tenure too long,

and probably you are right in thinking so, but, at any rate, he acquitted himself with great distinction in his day.

His treatise on *The Principles of Surgery*, of which the first volume appeared in 1829, will bear reading today, for more than its purely literary interest. If I refer to the first volume, I do so because it is the one which I have chiefly read, and you will find, in quite a number of directions, how accurate and original are many of the observations of its author on such subjects, for example, as the phenomena of inflammation. He describes these phenomena in considerable detail, from the clinical aspect, illustrating his descriptions with reference to different tissues, and also reports, at some length, the results of experimental research, e.g., regarding the effects of experimental irritation of the liver of a frog. Many of the observations which he made are of much interest today. Or take his classification and description of tumors and read his suggestive discussion of their possible methods of origin, and you will find not a little that may afford help in our research today into the problem of their causation.

His chapters on hemorrhage, wounds of arteries, formation of false aneurisms, on true aneurism, on aneurismal varix, and varicose aneurism, leave little to be added to in accuracy of description, even in the light of present day knowledge. Burns writes throughout with clearness, without any sign of over assurance, but with the style and force of a master of his subject, and with the mark of one whose whole heart was in his work.

It is to me a very notable and delightful thing to find that he dedicates his treatise to one of his colleagues on the Senate, James Jeffray, M.D., then the professor of anatomy. Burns inscribes his treatise to Jeffray, "as a mark of respect and esteem,"—evinced a fine spirit between colleagues. Jeffray was appointed professor of anatomy in 1790, and held office till 1848, i.e., 58 years—surely a long term of office. The terms of office of the two, Burns and Jeffray, ended within two years of each other.

Prior to his appointment to the Regius Chair of Surgery, Burns had taught anatomy, surgery, and midwifery at a private School of Anatomy in the City. Later, he taught anatomy and surgery in the Anderson's College in Glasgow. It is of interest to relate, also, that Burns had made a reputation for himself, quite apart from anatomy and surgery, as a writer on midwifery. His *Principles of Midwifery*, published in London in 1809, went through ten editions, and was translated into other languages.

Dr Alexander Duncan in his *Memorials of the Faculty of Physicians and Surgeons Glasgow* (5) says 'As a teacher of anatomy he had earned the reputation of being an able expounder of that science. This reputation went with him to the chair of surgery and, added to that which he further acquired, of being through his works on the subject the most popular expounder of midwifery in his day, was the means of attracting students from a distance.'

But there is one direction in which Burns achieved special distinction. On his appointment as a Surgeon to the Royal Infirmary, he recognized the need of teaching his subject clinically in the wards. He accordingly presented a memorial to the managers of the Infirmary, in 1797, in which he pointed out the advantages of this method of teaching and requested permission to give a course of clinical lectures in the wards of the hospital, during the ensuing session. The necessary permission was granted and from that time on though with occasional intermissions clinical lectures continued to be given in the Infirmary. This is not the place to refer to the some what varied and at first fitful history of the development of clinical teaching in Glasgow. Suffice it to say that John Burns has the distinction of having been the first lecturer on clinical surgery in Glasgow.

Burns was a man of European reputation not only as we have seen in surgery but also in midwifery. He was a Fellow of the Royal Society and a member of the Institute of France. His portrait by Graham Gilbert is in the possession of the University of Glasgow.

Burns was lost in the wreck of the *Orion* in 1849.

JAMES A. LAWRIE, M.D. (1850-1890)

James A. Lawrie M.D. was the second Regius Professor of Surgery in the University of Glasgow. He held office for only 10 years and perhaps it would be just to say that his reputation was in the main a local one. Such publications as he made were I think purely in the pages of the *Glasgow Medical Journal* one of the pioneers of provincial medical journalism. Lawrie was in fact for some time editor of this journal. Prior to his appointment to the Regius Chair in the University he had held office as professor of surgery in Anderson's College to which he was appointed in 1829. He was also an active member and indeed one of the promoters of the Medico-Chirurgical Society of Glasgow which was constituted in 1844 as a rival of the older and, as many of its members thought, too conservative and un-enterprising Society, known as the Glas-

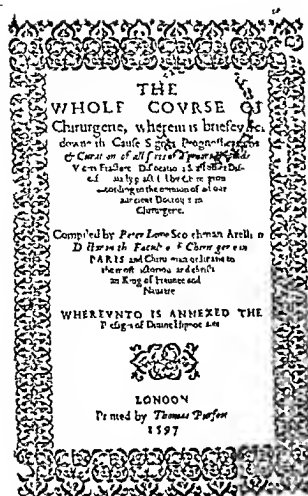
gow Medical Society, which dated its origin back to 1814.

One would not be doing simple justice, however to the memory of Lawrie did one not bear witness to the very important part he played in one direction. Indeed the reference that I feel bound to make furnishes to my mind a somewhat unusual instance of the far reaching effect that carefully compiled statistics may have in affecting teaching and practice. Lawrie's statistics, and his personal views, based on these statistics had reference to the treatment of fractures of the skull and it seems to be the fact that they led directly or indirectly, to the reversal to what had come to be almost generally accepted teaching on this subject in Great Britain at least.

The tale is worth the telling as illustrating how, in one important direction at least Lawrie impressed his views and teaching on surgical opinion and practice. It has the added interest that it was in a branch of surgery that Lawrie's great successor of over 30 years later Sir William MacEwen, was to develop in such remarkable degree, viz in the matter of cranial surgery.

The history of the development of the surgery of the skull and brain, as you are doubtless aware, has been one of curious variation in rate of growth marked by a degree of advance and enterprise in the very earliest periods that seems difficult to realize and later by a very long period of comparative stagnation. Even when once more the march of progress seemed to have been resumed it was only to lapse again and to fall almost into disrepute. Let me remind you of some of the salient landmarks in its early history, and lead you on to the later developments in which Lawrie's work played a part.

Operations on the skull, as you are aware and as Sir Berkeley Moynihan reminded you in his John B. Murphy Oration in 1920 were known in the earliest periods of history. Hippocrates (360 B.C.), Celsus (A.D. 17) and other surgeons of their respective periods down the centuries, used the trephine or trepan. This is well known and there are abundant records, pictorial and descriptive of many of the instruments they employed. Many of these I figured in a paper delivered in 1914. It is remarkable how close a resemblance many of them bear—trephines, trepan saws, raspatories, etc.—to the instruments we use today. But more remarkable even than the considerable state of development of cranial surgery in the Hippocratic times, is it to realize that, before the dawn of history, purposeful trepanning was occasionally carried out as a therapeutic measure.

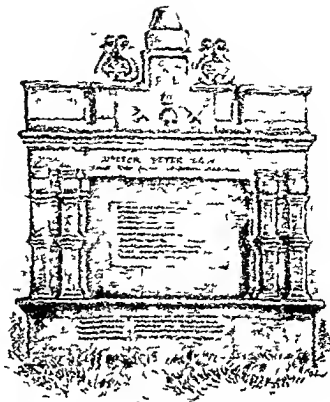


Title page of first edition of the *Chirurgie*, from the copy in the Library of the Royal Medical and Chirurgical Society of London

Lucas Championniere, in his work on *Les Origines de la Trepanation Decompressive*, depicts a skull from the Neolithic period, which shows a large, smoothly rounded orifice in the left parieto-occipital region, which is almost certainly relic of a therapeutic trephining. Had it been done at the present time it could hardly have been bettered and remember, it must have been done with flint instruments.

And, in skulls collected from the burying grounds of the Incas of Peru, and from caves and tumuli in France, some certainly of the Stone Age, he found evidences of the operation having been performed with some frequency. He was convinced not only of the operation having been carried out but also that the appearances went to prove that the patients must have survived operation for long periods.

It has been recognized, indeed, that prehistoric craniectomies were not uncommon, and some authorities have gone so far as to suggest that they



Peter Lowes' tomb in the churchyard of Glasgow Cathedral

had some religious significance. Victor Horsley, however, after making a careful examination of that great collection—yet so badly housed withal—in the Broca Museum, Paris, in 1887, concluded “(1) that the operative openings were always over the site of representation of movement, on the cerebral cortex, (2) that the patients had probably been suffering from Jacksonian epilepsy, (3) that the operation would gain a certain reputation for the cure of convulsions generally, and (4) that at least some of the operations, e.g., for depressed fractures would result in cure” (2).

The writings of Hippocrates, and others of his times and during the centuries immediately following show that even then trephining was based on a knowledge much more advanced than one might have expected. It seems that Hippocrates trephined for the purpose of decompression, to relieve inflammation, for the evacuation of pus and blood, and for the extraction of foreign bodies. His writings show, also, that he recognized the contralateral distribution of convulsions and paralyses following certain head injuries. It is even on record that he recommended the use of the trephine for the treatment of blindness occurring without any visible disease of the eye. This would seem to be, surely, the very earliest known evidence of the recognition of the value of

decompressive trephining for the relief of what we now know as optic neuritis, and its consequent blindness.

I mention all this to emphasize what I have to say regarding the part played by Lawrie over 2000 years later, in helping to re-establish the practice of what one might call 'preventive trephining' in cases of fracture of the skull with depression of bone.

For you must not suppose that even the level of the Hippocratic teaching in this connection was adhered to and sustained in the many centuries that followed. During these centuries following upon the times of Hippocrates and Celsus trephining or trepanning had a strangely changing and chequered history.

The operation continued to be practiced here and there, and by many surgeons but there were periods when it almost seemed as if it were to be abandoned. References to it are to be found in the writings of Roger of Salerno (1170 A.D.) Walter of Aylton (middle of thirteenth century) Ambroise Paré (1560 A.D.) Andreas a Cruce (1573 A.D.) Fabricius Hildanus (1560-1634 A.D.), and so on. But it was not till the time of Percival Pott (1713-1783 A.D.) that, in Britain at least the rule of practice was established—'That, in every case of fracture of the skull with depression, the skull should be perforated and the depressed fragment of bone either raised to its proper level, or entirely removed.'

This rule of practice laid down by Percival Pott however did not hold its own far into the succeeding century. Opinion became so changed in fact that Pott's teaching fell into disrepute and was very generally rejected in Great Britain. And it was not only in Britain that this was so. Desault of Paris, for example writing about 1809 A.D., maintained—'that in view of the numerous unfortunate results of the operation of trephining or trepanning its practice was reduced down to only trephining in compound fractures of the skull, and to depressed fractures with symptoms' (the italics are mine A.Y.). Perhaps one of the most extreme statements against the whole practice of trephining made about this period was that of Purrie who writing in 1830 A.D. said "These fractures and the numerous inventions of instruments for cutting the skull, are sad monuments of the surgery of past ages."

And so, for about half a century Percival Pott's teaching on the subject was practically set aside. Let us see what was the cause or at least the main cause of this reaction—this set back—in surgical opinion and teaching. It seems to be pretty clearly proved that to Abernethy—himself a notable

surgeon of his day—must be ascribed the main credit or discredit, of upsetting the teaching of Percival Pott. Writing about the year 1811 A.D. Abernethy expounded the view that the operation might often be dispensed with even in fractures of the skull where depression of bone was definitely known to be present. In support of his view, he related five cases of fracture of the skull with depression which he had had under his care and observation within 12 months in St Bartholomew's Hospital, and which terminated favorably, although no operation had been performed.

It seems that the account of Abernethy's five cases and the authority of his great name produced upon professional opinion in Britain so profound an effect that, according to Francis Adams who refers to the subject in his treatise on *The Genuine Works of Hippocrates* "it became the established rule of practice in British Surgery never to interfere, in cases of fracture of the skull unless with the view of removing urgent symptoms. But this reactionary teaching was not long to hold the field, and Francis Adams ascribes a notable place in the overthrow of such a rule of practice, to what he terms "the elaborate and trustworthy statistics published in 1844 A.D. by Dr Lawrie, of Glasgow." These statistics were compiled from the records of the Glasgow Infirmary—now the Glasgow Royal Infirmary. Adams discusses these statistics at some considerable length but it is sufficient for my present purpose, to quote only Lawrie's conclusion which was as follows: "From what we have said it will appear that we coincide with those who in using the trephine, in cases of compound fracture of the skull look more to the state of the bone than to the general symptoms and who employ it more as a preventive of inflammation and its consequences than as a cure for urgent symptoms, the immediate result of the accident" (14).

This then was the Lawrie who a few years later, became Regius Professor of Surgery in the University. If he never accomplished more than this by which he helped to turn the whole direction of surgical teaching in respect of the operative treatment of fractures of the skull he had not lived in vain. Glasgow remembers him with pride.

JOSEPH LISTER M.D., F.R.S. ETC (1860-1869)

Then came Lister. Joseph Lister was appointed to the Chair in the year 1860, and held office for 9 years, when he went to occupy the corresponding Chair in the University of Edinburgh. When that is said, almost all has been said that need be said.

Every one is aware of what his work has done both for the Art and for the Science of Surgery, and the fact that Lister's epoch making investigations, and his initial application of these investigations to the practical technique of surgical treatment were begun and in great measure brought to fruition in Glasgow during his tenure of office there, can surely never cease to be a matter of infinite pride to all of the alumni of our University.

Lister, perhaps the foremost benefactor of the human race, applied to surgical practice with unerring deduction and judgment, the principles that had been suggested to his mind by the laborious and brilliant observations of his co-worker and friend, Pasteur.

And even though others before him had had at least some inklings of the truth like Semmelweis, who, in 1847, traced puerperal fever to infection and showed how it could be prevented, incurring not a little opposition and even obloquy thereby, from those chiefly whose work was to benefit so largely from his teaching, or like Iénaire who in 1863, in a treatise on carbolic acid, advocated its use for the destruction of germs in wounds or like Bottini who, in 1866, advocated the employment of carbolic acid in suppurating wounds, because he was of the opinion that germs were the active agents of suppuration it yet remains none the less true that Lister's application to the practical problems of surgery particularly in respect of the healing of wounds of the scientific results of Pasteur by which he deduced the general laws of antiseptis, has been the very foundation of modern surgery.

It required the master mind of Lister to solve the riddle, to work out fully the problem of the prevention of wound infection, which had baffled surgeons up to his time, to show how nature could be entrusted with repair, so long as infective germs were excluded from a wound, or were counteracted by suitable antiseptic agents. Lister did more than any man to free surgery and surgical achievement from the bonds that shackled opportunity and that limited its advance in almost every direction. As Virchow said of Moragni, so let us say of Lister "Ihm sei die Ehre" (To him be the honor).

I may be allowed to quote the words employed by your illustrious compatriot, Mr Bayard, when as Ambassador in London proposing the toast of Lister's health at a banquet of the Royal Society, he exclaimed

'My Lord, it is not a profession, it is not a Nation it is Humanity itself which, with uncovered head salutes you'



Master Peter Lowe

What I may be permitted to call The Lister Tradition is more than sufficient to render the Regius Chair of Surgery in the University of Glasgow illustrious for all time.

On the rising ground on which the University buildings are reared and in a proximity to each other that seems significant of much have been placed memorials to two of Glasgow's greatest men—Lord Kelvin and Lord Lister. Who shall attempt to estimate or to appraise the relative greatness of each? We do not honor Lister the less I am certain, when we place him alongside that other great man whose mathematical genius, and whose deductive reasoning in the realms of pure and applied mathematics, remain one of the wonders of our time.

Viewing surgery purely as an Art Lister may not have been the greatest surgeon of his time. Indeed, it seems to be generally admitted that a good many of his contemporaries surpassed him in mere manual dexterity and in the technique of operative work. But, viewing surgery as a science, Lister was probably the greatest surgeon of all times.

Only once did I see Lister, only once hear him speak—in his later years. To that occasion I shall have to allude later on, in speaking of MacCewen. I mention it now merely to say that one of the memories which I cherish is that of shaking hands as I did on the occasion referred to with the immortal Lister.



John Burns first Regius Professor of Surgery, Glasgow University

SIR GEORGE H B MACLEOD MD LL D FRC
(1869-1892)

Lister's immediate successor was Sir George H B Macleod who occupied the Chair from 1869 to 1892. He was not only a notable and able surgeon, he was one of the ablest teachers of surgery that I have known. His teaching was of course of the didactic type. It had not the originality of thought either of his immediate predecessor or of his immediate successor. Probably it did not stimulate as theirs did originality of thought in his disciples and students.

His surgery of course was not the surgery of today, and much of his teaching would not be accepted today. His teaching was dogmatic, largely based on authority, and on accepted or supposedly accepted and fixed doctrine. But Macleod certainly had the gift, in almost unique degree, of imparting to his students the knowledge that he wished to impart. He had an orderly, methodical mind, was possessed of great powers of description and of illustration, and he had a habit of great industry. His lecture room was always crowded, his clinical lectures were enthusiastically attended.

His distinguished, commanding presence, his fine head, his courtly manners, live still in the minds of his students, of whom many still survive.



James A. Lawrence second Regius Professor of Surgery, Glasgow University

It was my lot to begin my studies at the University three years before his death, just in time that is to see a little of his work, to hear something of his teaching, to observe for myself his power of imparting his views. No doubt, he was already considerably past his best, but even the short experience that I had of his teaching left a vivid impression on my mind, and this although already his younger and more vigorous and original rival, who was so soon to be his successor in the Chair, had lit a beacon in the east of Glasgow that outshone the brilliance of that in the west.

During the tenure of the Chair by Sir George Macleod, its honor and prestige were fully maintained.

SIR WILLIAM MACLEWEN MD LL D FRS LSC
(1892-1924)

The fifth Regius Professor of Surgery in Glasgow was Maclewen. Appointed to the Chair in 1892, he occupied it until his death, 32 years later.

Maclewen, after Lister, was undoubtedly the most distinguished and most famous of the occupants of the Chair. His lamented death is perhaps too recent to allow an accurate estimate of his life and work, or to determine exactly what place he should occupy in the history of surgery. Even a provisional estimate of his influence both on the Art and on the Science of Surgery is dif-



LISTER

Joseph Lister third Regius Professor of Surgery Glasgow University

fiicult But this at least can be said, without hesitation, that in that "Great Procession" spoken of by Moynihan his will be, certainly, one of the greatest, one of the most outstanding figures

I have dealt, at considerable length—I trust not uninterestingly—with the lives and the work of Macewen's great predecessors in the Regius Chair of Surgery in Glasgow, also with their pioneer ancestor Maister Peter Lowe I have taken this method of suggesting to you, in terms of the most prominent actors in the drama, the development, through the years, of the school of surgery in Glasgow What I have told you of these men has been largely culled from history, and presented to you by one who has perhaps no more aptitude to assess the verdict of history upon them than many of yourselves who has, indeed, perhaps the defect of such bias as naturally springs from his personal attachment to the same School, and his jealousy for its prestige Such estimate as I have given, at any rate—except, to a slight extent, in the case of Sir George Macleod—has not the authority of one having had a personal relationship with him of whom he speaks or writes, the "personal touch" is quite absent

Of what I have to say regarding Sir William Macewen such complaint can not be made If



George H. B. Macleod fourth Regius Professor of Surgery Glasgow University

there is anything of value, in enabling an accurate estimate of the man and his work, in the "personal touch," then I may be said to have that necessary qualification, whatever other qualifications may be lacking I was a member of his Class of Systematic Surgery and of his Classes of Clinical Surgery I was his house surgeon, and later, for a period, his assistant So that I was brought fairly closely into association with him My hope, therefore, is that from such personal association as I was privileged to have with him, I may be able to succeed in making you "see Macewen plain" If, in a measure, I am able to achieve my object in that respect to present to you a word picture of the life and work of that great man, which shall have the effect of enabling you to form some idea of the man and his work as those saw him who knew him best, I shall be amply rewarded

First of all, it is best to be quite frank, and to tell you that what I have to say about Macewen is based upon, and indeed, largely embodies the substance of, the Oration which it was at once my duty and my privilege to deliver, on June 23 last, at the Service of Commemoration of Benefactors in the University of Glasgow We have commemoration biennially on the occasion of the Honorary Graduation Ceremony for the year This year the University Court decided that the subject of commemoration should be Sir William Macewen I have had the temerity to present to you today the substance of what I said



William Macewen Fifth Legius Professor of Surgery
(Glasgow University)

on that occasion. I do so however not on my own authority. I or the choice of subject you must ascribe some part of the blame if blame there be to your Director General Dr Franklin Martin (50)

I do not propose to say anything of a purely biographical nature of Macewen nor to attempt to separate his Life from his Work. To my mind Macewen's Life and Macewen's Work were synonymous. If his life was not his work at any rate his work was his life. His whole life was work and purposeful work. One often hears the phrase putting in the time or passing the time. There is the French phrase *pour passer le temps*. Macewen could never have used such a phrase of himself. I could not imagine Macewen ever doing anything *pour passer le temps*. I think he must have been impressed as so many of the world's greatest men have been with the very meager store of knowledge so far wrested from the Book of Nature compared with the vast realm of the still unknown and have been actuated throughout his life by the determination perhaps hardly formulated in his mind but none the less implicit in his conduct to devote his great powers unceasingly and without rest to making advance in orderly fashion along the line of progress to adding his share to the book of discovery.

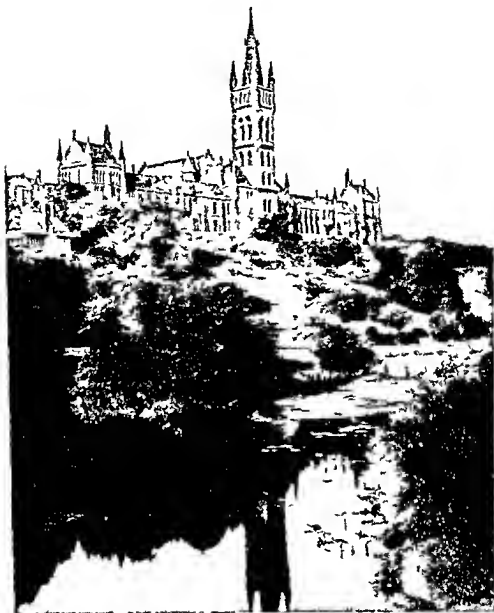
I have been perusing recently a list of Macewen's published works. It is a remarkable list though by no means complete. It comprises more than seventy separate contributions to the literature of surgery. The greater part of the list is made up of papers and monographs of such importance and representing such a mass of scien-

tific research as might have occupied the time and the energy of several earnest workers.

In addition to the many shorter papers almost all with their own intrinsic value there are the longer papers addresses and lectures before learned and scientific societies all of importance and most of them striking some original note or suggesting some new line of research. Nor does this end the list there remain the larger works which by their inherent merit have established themselves as standard presentations of the subjects with which they deal.

Macewen's treatise on *Pyogenic Diseases of the Brain and Spinal Cord* and his works on *Osteotomy* and on *The Growth of Bone* rank already as classics. His *Atlas of Head Sections* is a contribution to the surgical anatomy of the skull and brain which stands out as a permanent addition to scientific knowledge. The cost of its production must have made it almost as notable a failure financially as it was certainly almost priceless as a contribution to anatomy and surgery. It must have cost infinite time and infinite labor to produce such as would have taxed almost beyond limits the capabilities of most men. But Macewen as the saying goes, took it in his stride and the

Atlas appeared in the same year as saw the publication of his great work on *Pyogenic Diseases of the Brain and Spinal Cord*. Both of these were published only 5 years after the great address on *The Surgery of the Brain and Spinal Cord* which he gave before the British Medical Association in Glasgow in 1888. These 5 years must surely have been full years for Macewen and for those who worked with him for even these publications did not represent all his interests during that period. Within the same period he found time to publish a notable paper on the surgical treatment of aneurism. On Aneurysm Its Cure by Inducing the Formation of White Thrombi within the Sac (26) to contribute to Christopher Heath's *Dictionary of Practical Surgery* articles on 'Diagnosis of Head Injuries Fracture of the Skull Encephalitis Meningitis and Abscess of the Brain Compression of the Brain Hernia of the Brain Osteotomy Grafting Tracheal Catheterism (25) and to lay before the Medico-Chirurgical Society of Glasgow in his capacity of President an exhaustive contribution to a discussion on anesthetics (27). In this last contribution he embodied his own considered conclusions on the subject of anesthesia and discussed the conflicting claims of the advocates of chloroform on the one hand and of ether on the other. He described the dangers of general anesthetics and laid down definitely and explicitly,



University of Glasgow

his own views as to how these dangers might best be avoided or counteracted. The views he expressed then remained with him for the rest of his life and the instruction which he gave to students on the subject of anæsthetics may be said to have been enshrined in this contribution.

This period of 53 years must have been almost the busiest of his life. During the later part of it I came for the first time into touch with him, and I was able to see for myself how little rest he took. His days were prolonged far into the night. He sought little relaxation, except in a change from one direction of work to another. His week days encroached upon his Sundays, indeed Sunday was

usually a "Field Day" not only for himself but for all who were associated with him.

Attempting to analyze the character of Macewen, as I saw him, certain special traits seem to me to stand out very clearly. There was, first of all, *his infinite capacity for taking pains*. No amount of trouble was too great, if it meant the accomplishment of any good purpose, the clearing up of a difficulty, or the confirming of an observation.

Macewen was meticulous in testing his tools, as in verifying his facts. In his monograph on *Osteotomy* (20), considerable space is devoted to a careful description of the tools which he used, and one realizes, as one reads, what endless pains he



William MacEwen Fifth Lancelot Duke of Edinburgh
(Glasgow University)

on that occasion. I do so however not on my own authority. For the choice of subject you must ascribe some part of the blame if blame there be to your Director General Dr. Franklin Martin (50).

I do not propose to say anything of a purely biographical nature of MacEwen nor to attempt to separate his Life from his Work. To my mind MacEwen's Life and MacEwen's Work were synonymous. If his life was not his work at any rate his work was his life. His whole life was work and purposeful work. One often hears the phrase putting in the time or passing the time. There is the French phrase *pour passer le temps*. MacEwen could never have used such a phrase of himself. I could not imagine MacEwen ever doing anything *pour passer le temps*. I think he must have been impressed as so many of the world's greatest men have been with the very meager store of knowledge so far wrested from the Book of Nature compared with the vast realm of the still unknown and have been re-tuated throughout his life by the determination perhaps hardly formulated in his mind but none the less implicit in his conduct to devote his great powers unceasingly and without rest to making advance in orderly fashion along the line of progress to adding his share to the book of discovery.

I have been perusing recently a list of MacEwen's published works. It is a remarkable list though by no means complete. It comprises more than seventy separate contributions to the literature of surgery. The greater part of the list is made up of papers and monographs of such importance and representing such a mass of scien-

tific research as might have occupied the time and the energy of several earnest workers.

In addition to the many shorter papers almost all with their own intrinsic value there are the longer papers, addresses, and lectures before learned and scientific societies all of importance, and most of them striking some original note or suggesting some new line of research. Nor does this end the list there remain the larger works which by their inherent merit have established themselves as standard presentations of the subjects with which they deal.

MacEwen's treatise on *Progenic Diseases of the Brain and Spinal Cord* and his works on *Osteotomy* and on *The Growth of Bone* are already classics. His *Atlas of Head Sections* is a contribution to the surgical anatomy of the skull and brain which stands out as a permanent addition to scientific knowledge. The cost of its production must have made it almost as notable a failure financially as it was certainly almost priceless as a contribution to anatomy and surgery. It must have cost infinite time and infinite labor to produce such as would have taxed almost beyond limits the capabilities of most men. But MacEwen was the saying goes took it in his stride and the *Atlas* appeared in the same year as saw the publication of his great work on *Progenic Diseases of the Brain and Spinal Cord*. Both of these were published only 5 years after the great address on *The Surgery of the Brain and Spinal Cord* which he gave before the British Medical Association in Glasgow in 1888. These 5 years must surely have been full years for MacEwen and for those who worked with him for even these publications did not represent all his interests during that period. Within the same period he found time to publish a notable paper on the surgical treatment of aneurism. On Aneurism Its Cure by Inducing the Formation of White Thrombi within the Sac (6) to contribute to Christopher Heath's *Dictionary of Practical Surgery* articles on 'Diagnosis of Head Injuries', 'Fracture of the Skull', 'Incephalitis Meningitis and Abscess of the Brain', 'Compression of the Brain', 'Hernia of the Brain', 'Osteotomy', 'Grafting', 'Tracheal Catheterism' (5) and to lay before the Medical Chirurgical Society of Glasgow in his capacity of President an exhaustive contribution to a discussion on anesthetics (27). In this last contribution he embodied his own considered conclusions on the subject of anesthesia and discussed the conflicting claims of the advocates of chloroform on the one hand and of ether, on the other. He described the dangers of general anesthesia and laid down, definitely and explicitly,



The Western Infirmary Glasgow

from various injuries to the skull and brain, and their diagnosis from conditions due to alcohol. The "Macewen Pupil" has been recognized since then as a definite sign of alcoholic coma, and the value of the paper in differentiating this from coma due to injury, direct or indirect, to the brain or its membranes, has long been established.

Again, the many cases of wounding which were brought to the Police Station, particularly on a Saturday night, afforded an opportunity to study and classify wounds, according to the type of instrument causing them, and the results of Macewen's study were embodied in a paper entitled "Wounds, in relation to the Instruments which produce them," which appeared in 1876 (17).

About the same time a further paper appeared, entitled "Penetrating Wounds of Thorax and Abdomen" (16). The observations on which it was founded, though made in the routine work of a Police Casualty Surgeon, probably had something to do with the direction of his thoughts toward certain problems of thoracic surgery, that were to take more definite shape in the later years. This paper, one of his earliest efforts, was read before the Medico Chirurgical Society of Glasgow in 1874, 5 years after he graduated, and when he was only 26 years of age. Mr. J. H. Pringle, one of Macewen's earliest assistants, pointed out, in the course of his memorial tribute to Macewen (41), that "the experience gained in connection with wounds of the thoracic wall would seem to have given him the first hint regarding his molecular cohesion theory, especially in connection with the pleural surfaces"—a theory that he was to develop at length over thirty years later.

In 1902 he read a paper before the Nottingham Medico Chirurgical Society on the "Surgery

of the Lungs" (29). His Cavendish Lecture in 1906 was entitled "Some Points on the Surgery of the Lung" (30). In it he expounded at considerable length, his views upon the cohesion of the pleural surfaces. He had satisfied himself—it is doubtful if he ever fully convinced others—of the truth of these views. Much controversy was aroused on the subject. He returned to the fray on the same subject in 1913, when he contributed to the Seventeenth International Congress of Medicine, in London, a communication on "Intrathoracic Surgery" (32).

A somewhat melancholy interest is attached to the fact that what was, so far as I have been able to ascertain, his last published communication dealt with much the same theme. It was given in 1923, before the Australasian Medical Congress during the world tour which he made on behalf of the British Medical Association. Its title was "The Physics of the Lungs and Pleura" (34). Is it not a somewhat remarkable thing that this, Macewen's last paper, appeared almost exactly 50 years after his paper on "Wounds of the Thorax," which was one of his earliest? And the subject so nearly akin in each! What a gap in time, and "the wheel coming round full circle!"

A third trait must be referred to. It is what I would call, without offence, *his self sufficiency*. Sir Donald MacAlister, in an address which he delivered, on the occasion of the Unveiling of a Mural Wreath and Tablet at Erskine, in memory of Macewen, on June 20, 1925 stressed the fact that Macewen was not a "co-operator" (15). It is true. Macewen had confidence in his own powers, his own resources, his own judgment. He did not readily accept the judgment of others.

He seemed almost to cultivate a spirit of distrust of anything that he had not himself put to the proof. Tradition meant little to him. Surgical dogma he accepted only where and when his own judgment was convinced, by his own observation and his own deduction. He exhibited the same habit of mind in his teaching of his students. He ever advised the student to ask himself with each fresh page he turned the question 'Why?' He had much sympathy with the attitude of philosophic doubt.

Most teachers are familiar with the type of student who is ever making supplementary, often awkward inquiries. He has been dubbed the anxious inquirer, but he is often a most useful fellow. He stimulates the teacher and his fellow students to further thought to greater care in presentation of a clinical picture, to the avoidance of loose statement. Macewen in my judgment was the anxious inquirer *par excellence*.

I believe that in his student days Macewen was indeed such an anxious inquirer. Frequently waiting after a lecture to question his teacher or to argue with him on some part of the teaching which was not clear to his mind. This attitude remained with him throughout his life.

But this habit of trusting as he did in his own powers and doubting others had the effect of making him incapable of co-operation with others in scientific work. Team Work, the team spirit were not attractive to him nor could he have remained for long as a mere member of any team. He would have kicked over the traces very soon. He believed in doing things for himself and in having things done for him by others only where such others acted along the lines he the Master laid down. He was all right as the center of a little group of which he was the controlling influence. But the work of the group must be his, its line of action his, its responsibility and its conduct his. He was indeed the typical individualist. In his little group he was supreme. He directed operations with skill. He had the faculty of getting the last ounce of work out of those who assisted him, because he gave the last ounce himself. And yet one could have wished that he had been less of the individualist, more sympathetic to others engaged in scientific investigation, a little more complacent, a little more yielding. Even in respect of his attitude to his assistants, something of the spirit of co-operation would have been productive. I believe of more good than harm.

How different was the attitude of Mikulicz at the great Surgical School at Breslau! Twenty six years ago I spent some time there. Von Mikulicz

another great man was then at the height of his activity and fame and he had around him a remarkable group of energetic and able younger men. Von Mikulicz was the head of the School and his spirit inspired the School to such effect that there issued from it during these years such a mass of important records, papers and varied publications dealing with subjects of great surgical interest as has hardly been equaled—probably never anywhere surpassed—in the same period of time. This great output of work was the result of the highly developed 'team spirit' that marked the whole working of the School. Nearly all the papers that issued from the Breslau School in that period appeared under the joint names of Mikulicz and one or other of his assistants. Mikulicz lost nothing by having the name of an assistant associated with his own. Each of his junior collaborators gained enormously by having associated with his name that of his great Master. And the Breslau School of Surgery gained in prestige all the time.

It is pleasing to be able to say that we have seen something of this collaboration in recent times in Glasgow, most notably perhaps in the departments of pathology and of physiology. And the result is there for all to see. I do not require to tell you of the success of the Glasgow School of Pathology. The Glasgow School—the Muir School—is well known and deservedly famous. The work of the Glasgow School of Physiology is also well known. It may be said that so also is the Glasgow School of Surgery and it is of course true. It could hardly be otherwise with a School that can show on its roll of teachers two such names as those of Lister and Macewen. I have often wondered however if it might not have been more famous still had Macewen been less of an individualist—more of the team worker.

Be that as it may, the fact remains that Macewen had the habit of working alone. He began his life work when knowledge of the bacterial agents of disease was meager and unreliable when it was necessary to break down much erroneous tradition and when the older beliefs of the pre-Listerian days had not yet been set aside and these beliefs died hard. In the beginning he worked alone largely because he was one of the few who from the first accepted whole heartedly the teaching of Lister and the opposition which those who believed in the Master's teaching had to encounter was stiff and fierce. He acquired then probably a habit of mind and of work that became a part of his very nature.

The late Dr. McGregor Robertson said of him in the obituary notice which he contributed to the

Lancet (36) "Macewen had no charts of the region he set out to explore no guide in the darkness he set out to illuminate He had to devise his own methods, to forge his own instruments He worked alone"

And even as he lived alone and worked alone, although surrounded by an always enthusiastic group of assistants, so also he lived alone in so far as his professional relationship with his fellows was concerned I have said elsewhere (48) that Macewen 'lived apart from the fraternity of his profession, and was always somewhat of a lone figure' The wonder of it all is that in spite of all he made so deep a mark on the whole trend of surgery in Glasgow

There is one characteristic of Macewen's work which calls for special reference, namely, its *quality of thoroughness and completeness* His research was thorough, and his deductions were not hurriedly made He was careful that no misinterpretation of facts should lead him astray, and so, as has been remarked by Mr J H Pringle (41), "He was never in a hurry to publish When he made his statement it was final, he had the proof of its correctness"

This note of *finality* is peculiar to much of Macewen's work and much of his writing One would not suggest that it is possible ever to reach finality in research, and Macewen would have been the last man to make such a claim, but one may say that Macewen explored every obvious avenue of approach considered every possible source of error made the most painstaking study of literature having any bearing on the subject, and having applied all possible tests, he was able to come to a conclusion which was to him final

This does not mean that further research, even on the same line was unnecessary It might indeed mean rather, that by the very establishment of this final position was rendered possible the making of a further step forward It represented merely one more well set rung in the ladder of advancing knowledge

See how this may be illustrated from his own development I have referred already to his early observations regarding wounds of the thoracic wall, and to his later work on the surgery of the lung, the second a natural development of the first His classical work on the regeneration of bone work involving enormous observation and much experimental research, was begun in or about 1878, and was continued during the rest of his life but it is probably true that the paper which he published in the *Annals of Surgery* in 1887 (23) contains what one may regard as his final conclusions on the role of the osteoblast, and

of the periosteum, respectively, in the growth of bone He had proved conclusively, by the case which has become historic, in which he built up a new humerus by successive grafts of bone taken from six tibiae that bone could, in fact, be transplanted, and live in its new site We have here, beyond doubt, the initial step which led to the more recent advance in the direction of bone grafting Macewen led the way, surely and firmly setting the step over 47 years ago His initial work too on the "Surgery of the Brain and Spinal Cord"—a finished piece of work, if ever there was one—formed the starting or leaping-off point for the great advances of more recent years Surely, looking back upon his life's work, he must have had much satisfaction in what he was able to accomplish, once for all

No sketch of the life and work of Macewen would be in any sense complete did it not include some more particular reference to three special aspects of his work These are First, Macewen's share in the development of modern aseptic surgery, second, his work upon bone, and third, his pioneer work upon the surgery of the brain and spinal cord I propose to say a little on each of these themes

Aseptic Surgery

It has been said that Macewen was fortunate in having begun his work exactly at the right time Ballance has expressed something of the same idea, in his obituary tribute to Macewen (3), when he says "Macewen lived through the most glorious period of British Surgery" And, indeed, that is true enough Lister's great discovery had just made possible the great expansion that the world was to see in the succeeding years, and the discoveries of Humphry Davy, Horace Wells, Morton, and Simpson, with regard to the practicability, as general anesthetics, of nitrous oxide gas, ether, and chloroform had but recently added further to the possibilities of surgical advance

Without Lister's discovery, and the great boon of general anesthesia, much of Macewen's work would have been impossible To that extent, therefore, it may be admitted that Macewen was born at just the right time, when, as has been remarked by Patrick, in his memorial tribute to Macewen (40), the possibilities of surgery "were opening up like great tracts of undiscovered country" But one must admit that Patrick is right in adding, 'a genius such as his would have found undiscovered country to explore in any period'

Macewen played a great part in commending to his fellows the Listerian doctrine of wound infection and its prevention. He was from the first an ardent disciple of Lister and he endeavored to apply the Listerian doctrine in his work from the earliest period of his career. His earliest papers show this.

In Glasgow as elsewhere there was much opposition and an exponent of the Listerian principles fearless and persistent as was Macewen was a tower of strength to the cause. He gave a large place to the Listerian discoveries in the instruction he imparted to his students. In his systematic class at the University he devoted a considerable time each year to the bearing of Lister's work on the prevention of wound infection. But he was not for long satisfied with the simple doctrine of antiseptics and of antiseptic surgery. He traveled farther than the Master.

At an earlier period probably than any other surgeon in Britain perhaps even in any country save possibly Germany he had passed on to the development of what seemed to him the natural outcome of Lister's doctrines, namely, the ideal of asepsis and of aseptic surgery. Long before any of his fellows in Britain he had developed in his clinic and was teaching holdly to his students what Sir Berkeley Moynihan has termed

The Ritual of a Surgical Operation and his Ritual soon became strictly an aseptic one. During the last 25 years of his life, asepsis and aseptic surgery constituted the ideal in his practice and teaching.

Certainly in one sense Macewen was fortunate beyond many of his fellows and more fortunate than most of the younger surgeons of later times. He was appointed to the responsible charge of wards in the Royal Infirmary, Glasgow at the early age of 29, an age when in the beginning of his manhood he was full of vigor and moved by great enthusiasm when he had still the fire line of youth and something of its boldness even of its daring. To this extent he was indeed smiled upon by fortune. But even before he became a visiting surgeon he had begun to make his mark and—with particular reference to what I have said regarding his attitude to the problem of wound infection and its prevention—he had already published several papers which proved how fully convinced he was of the surpassing importance of Lister's contribution to the science and art of surgery.

I have referred already to the tribute to his memory paid by McGregor Robertson and I venture to quote here at some length from the same article (36) an account of a pathetic little

monologue of Macewen recalled from memory by McGregor Robertson, who was his medical attendant in his last illness. I quote it with all reverence—it shows how near to Macewen's heart the subject was.

On one of the recent days the writer stood alone in the room by the bedside of Sir William when he lay high on his pillows enjoying a brief respite of peace and comfort from suffering. Quite suddenly and spontaneously in his ordinary quiet and deliberate voice he began to speak of Lister. I later had brought into his class one day a book from which he read to his students extracts from a paper by Pasteur in which the French chemist explained his view that putrefaction was due to the operation of living organisms. Lister had consulted an eminent chemist of the day as to the chemical means by which such organisms might be destroyed in living tissues and the answer he had received was that he could be supplied with a long list of such substances but what their effect might be on the tissues it was for the surgeon to determine. But the chemist had added "Try carbolic acid."

These were days scarcely to be imagined or conceived by the original student of the present day and I death following amputation after amputation in melancholy succession was diheartening in their degree.

William Macewen a junior student of surgery in the Royal Infirmary at that time was a witness to these events and one morning more than usually depressed by them he came out of the Infirmary and sat down on a bench to consider whether he could continue to pursue a study which could show only such results. An elderly woman of the domestic staff passed him as he sat in gloomy contemplation and struck by his pect stopped and said "What's makin ye sae ad the day fiddle?" To which he answered with a wave of the hand towards the hospital "Who could help being sad at these things?" The woman replied that it would be to more purpose to go back and try to mend them. The student went back to a recent amputation looked at the ligatures which projected in long ends from the wound. They looked dirty. He then had a look at the uncut ligatures which were made of hemp and were kept in a jar. They did not seem clean. He then asked and obtained permission to try if boiling would improve them. From the ligatures he passed to the needles and without further request passed to the instrument with increasing appreciable results. But he could not secure the cleanliness of the hand of the attendants who handled them all.

McGregor Robertson makes the following further comment which seems of interest as representing the impression made on his mind at the time.

The little monologue of which the foregoing is but the substance was spoken in a clear quiet voice without halt for fitting word without delay of memory as if the times the occasions the incidents stood out clearly in the peaker's mind as but things of yesterday. But the tale was unfolded with for that peaker a most unusual quiver of the mouth and moisture of the eyes. It was as if the peaker's mind traveled back down the long trail which he had followed and saw far down amid the darkness and cloud of ignorance and noisome pestilence the very spot and moment from which he had consciously and deliberately set forth on a determined road—the bitter narrow path of commencement full of hindrance and obstacles the toil some slow a cent—until at last he lay at rest upon the

shining peak—content There was in the quiet voice no note of exultation no self glorification in the calm narration only a fullness of content at the assurance that the task he had set himself to do more than half a century before had been accomplished

It is certainly true to say that Macewen played a large part in developing the practical application of the Listerian doctrine He was probably the first to use moist heat as a routine method in the sterilization of operation materials and dressings He experimented extensively in the effort to obtain a reliable way of preparing and disinfecting absorbable ligatures, sutures and drainage tubes

I remember how Macewen and his staff were for some time the only ones in Glasgow to clothe themselves in sterilizable white garments before entering the operating theater and how they were held up to a good deal of ridicule for so doing In time the prejudice was broken down and every one followed his example, but he was undoubtedly the pioneer, though he did not always get the credit he deserved The younger surgeons of today can hardly realize as they carry out unthinkingly, the routine of their aseptic ritual, how different were the conditions of barely 30 or 40 years ago

I have alluded earlier to the close personal relationship which I was privileged to have at one time with Macewen and I can testify, from the recollection of many conversations to the admiration and reverence in which Macewen held Lister I cannot refrain however from mentioning a memorable incident which dates back now 32 years It has reference to the one occasion, spoken of in an earlier part of this address upon which I saw Lister It is the more worthy of mention, in virtue of the glimpse it afforded of Macewen's attitude to the Master

Lister visited Glasgow in the month of May, 1894 for the purpose of delivering an address to the University Medico Chirurgical Society—a Society of some antiquity, by the way, which originated about 120 years ago,—a student Society It was a long promised engagement His subject was 'The Simplification of Antiseptic Treatment' The Hall of the Students' Union was crowded as well it might be on such an occasion In addition to students there were present many members of the Senate including Gardner Samson Gemmell Buchanan, Hector Cameron, Joseph Coats and Macewen

When Lister had finished speaking Macewen, as well as others was called upon to speak For a time he resisted the call At last he rose said a single sentence and resumed his seat It was this single sentence that expressed so clearly his attitude to the Master, and the effect it had upon

the company was, I know, remarkable It impressed us, in a way that hardly anything else could have done, as implying the deep reverence of one great man for an even greater I should have liked to be able to quote that sentence with some degree of certainty, but unfortunately, there exists some doubt as to what exactly Macewen did say My own memory sometimes plays me strange tricks, and I am not sure that here it can be implicitly relied on

My impression still is that Macewen said something like this 'When the nightingale sings, all the other birds are silent, lest their feeble notes disturb its song'

A colleague of mine on the Senate, however, who referred to the incident in my hearing last winter and who was present on the historic occasion as a very junior student, is of opinion that Macewen used the simile of the Contest of Song where, 'after the great singer had sung, no one dared to follow on, lest he disturb the echoes of his song'

A few weeks ago I put the question to another professional colleague, who had also been present on the occasion, as to whether he could recollect what Macewen said Without hesitation he replied—Oh yes Macewen used that quotation from *Richard III* (Act V, Sc 3), As in a theatre, the eyes of men after a well graced actor leaves the stage, are idly bent on him that enters next, thinking his prattle to be tedious

This conflict of evidence rather disconcerted me, so I wrote to another friend who I knew, had also been present—he had, indeed been the proposer of the vote of thanks to Lister—asking him if he could possibly recollect the correct version of Macewen's sentence I told him of the three versions I already had, and I said in my letter 'For Heaven's sake don't send me a fourth version' His reply was, 'I am sorry to say that I am no use to you at all As to what Macewen actually said, I can believe any one of the versions you give me It is a striking illustration of the vagaries of memory, as commonly met with in life'

students by such an authority—he was yet able to conceal his chagrin, and to say nothing that might imply the slightest criticism or disparagement of the Master. Lister had been pleading for simplicity in the application of his principles and perhaps unwittingly had seemed to reflect on many who like Maccewen had advanced farther even than himself along the road of natural development. No doubt Maccewen felt this and I know that he felt also that Lister's address contained a good deal that might be misinterpreted and that might appear to afford some superficial justification for relaxation in the scrupulous care which he was accustomed to urge on his students as essential in the preparation for and in the conduct of any aseptic operative procedure.

Sir William Gardner on one occasion—I am uncertain whether or not it was at the Lister meeting—characterized the position of Maccewen and those who followed him by using a parody of the well known phrase *Ipsis Hibernis Hiberniores*. He altered it thus *Ipsio Listero Listeriores*. The application of the phrase to Maccewen was undoubtedly an apt one for Maccewen in his teaching and in his practice did out Lister. Lister in other words he adopted the teaching of Lister regarding the causes of wound infection and the general principles underlying antiseptic surgery but he went further and strove toward the ideal of microbic exclusion and the attainment of healing of wounds free from infection. It is certain that in his own practice he very largely succeeded in the attempt but not without many struggles against prejudice and against the inertia of the self satisfied and of the ignorant. Aseptic healing of wounds became the rule in his wards instead of a fortuitous happening and in time the influence of established fact began to assert itself far beyond the more immediate ambit of his practice.

The Surgery of Bone

I have thought sometimes that Maccewen's work on bone must have been nearer his heart than any other of his scientific interests for he seems to have had his mind directed upon some aspect of it at nearly every stage of his career.

The historic case to which I have referred already in which a new humeral diaphysis was built up step by step by a series of heteroplastic transplants was first operated on by him as far back as 1878 (22), and he was able to follow out the after history of the case for over 30 years, so that in his final conclusions on *The Growth of Bone* which he published in book form in 1912 he was enabled to give a comprehensive description of the process over that extended period of

time along with photographs showing the end result of this great physiological experiment.

It can hardly be disputed that to Maccewen, more than to any other, we owe the development of the more recent advance in the practice of bone grafting. Transplantation of bone can hardly be discussed in any scientific assemblage without reference being made to Maccewen and his work.

It is difficult to escape the feeling that in his researches on bone Maccewen's keenness was constantly being whetted by the recurring controversy upon the rôle of the periosteum in the regeneration of bone. He was the great protagonist for the view that regeneration of bone was the property of the essential bone cell especially the active or embryonal form of this—the osteoblast. The volume referred to above *The Growth of Bone* (31) embodied the results of an inquiry which was admittedly undertaken to test by direct experiment problems connected with the growth of bone. In the preface he indicates that this inquiry seemed to him to be necessary as a firm belief exists that all periosteum produces bone—such is the physiological teaching—many believing that diaphyseal bone could not be produced without periosteum and once produced would die were the periosteum removed.

To many thoughtful observers the problem that Maccewen set out to solve the controversy that so intrigued him and indeed his whole argument were largely unreal being based on the assumption of a much too literal and restricted interpretation of the anatomical and physiological teaching of the day regarding the function and constitution of the periosteum.

The periosteum said Maccewen is a limiting and protecting membrane of great use in physiological and pathological conditions. There are no data to indicate that it can of itself secrete or reproduce bone. It has no osteogenic function. He held strenuously that in the activity of the osteoblast, and in it alone resided the osteogenic property. He would not admit that the periosteum should be regarded as consisting of two layers an outer largely fibrous and vascular and an inner containing in the meshes of an areolar tissue bone cells having osteogenic properties.

That deeper layer he would say is not periosteum. It is part of the bone. Or

'These osteoblasts which you say may be found in the deeper layer of the periosteum should not be found there normally. If you are able to find them there they are out of their normal habitat as the result of some abnormal process.'

In any case the great periosteum controversy occupied Maccewen much both in argument and

in experiment, through the greater part of his active life, and anyone who might be anxious for an argument could always be sure of a ready lure to draw him forth to battle.

Macewen's work on bone, however, found a more useful field of application than that with which I have just dealt. The surgical treatment of bony deformities early attracted his attention.

Almost from the beginning of his career, he turned his mind to the deformities associated with rickets, a disease then particularly prevalent in Glasgow. These deformities could hardly escape the notice of anyone moving about the city. Up to the time when Macewen began his work, no satisfactory method had been devised to deal with them. Macewen took up the work, directing his attention not merely to the surgical correction of the deformities, but to an inquiry into the cause of the disease. His first article on the subject, which appeared in 1878, that is, one year after his appointment to wards in the Royal Infirmary, was entitled "Antiseptic Osteotomy for Genu Valgum" (19). Other papers quickly followed, and Macewen pursued his observations and practice on a large scale, so that he was able in 1880 to publish, in book form, his monograph on *Osteotomy* (20). At the time of its appearance he had operated on 557 limbs, in 330 patients. Of the 330 patients 220 had genu valgum—367 limbs 110 patients had bow legs, anterior tibial curves, and other tibial curves, and ankylosis of the hip and knee—190 limbs. These numbers did not completely represent the total number of osteotomies performed, for in many cases multiple operations were required. The total number of osteotomies actually carried out was, in fact, 835. It is not possible here to detail the important data presented by a consideration of this large series of cases, though these are given at length and with detail in the book, but it is worthy of note that out of the whole list, only three patients died—one from pneumonia contracted prior to operation, one from tuberculous meningitis, and one from diphtheria. Considering the fact that the great majority were dealt with in the earliest days of the Listerian regime, such a result is remarkable, as is also the further fact recorded in the book, that, in the whole series, all the wounds healed without pus production, with the exception of eight cases. In only one of the eight did wound infection lead to serious trouble—surely a wonderful record for that time.

The publication of this monograph at once attracted widespread attention, and Macewen's operation of supracondylar osteotomy soon came to be accepted as the operation of choice

for the correction of genu valgum. Various other operative procedures had been devised recently by Ogston of Aberdeen (38), and by Chiene of Edinburgh (4). But these operations were not long to stand comparison with the operation devised by Macewen, whose book speedily took rank as a standard work, and was translated into every European language.

I have told elsewhere (48) how remarkable a personal triumph Macewen achieved in connection with his work on osteotomy, but the story will bear repetition, not only in respect of the remarkable ascendancy achieved by Macewen, but also by reason of the graceful way in which other surgeons accorded, to him and to his creation, the credit which meant for themselves the abandonment of their own special operative methods. The reference is to the Meeting of the Section of Surgery at the Congress International des Sciences Medicales, held in Copenhagen in 1884 when there was a great discussion on the operative treatment of genu valgum. In this discussion full and exhaustive consideration was given to the comparative results and the relative merits, of the operations of Macewen, Ogston and Chiene. The discussion took place 4 years after Macewen's book was published, so that Macewen was able to deal with larger figures than those in his book. He had prepared an elaborate statement, giving comparative statistics, of his own and other methods of operation. This was submitted with convincing force. The result was a short summary of the discussion placed thereafter. It may be found in the *Transactions of the Congress* (35).

for genu valgum and here in this great Congress before so many and eminent authorities I give in my address on to it. Surely a strikingly useful admission which must have required for its making a man of big and generous nature.

Chiene who followed said that it was evident from the clearly given statistics of Macewen that the profession had given by a large majority the preference to Macewen's operation. In these circumstances he Mr Chiene felt it to be his duty to state that he would try Macewen's operation on his return to Edinburgh. He congratulated Macewen on his great success.

Bryant of London said that he thought the Section after hearing what had been said would scarcely find it necessary to discuss further the relative value of the operations. They would all agree that Macewen's operation had been approved by statistics and also by the fact that the authors of the other methods had now practically given them up. He must say for himself that he had used Macewen's operation many times with very great success and it was gaining ground where previously Oxyton's operation had been practised. He was sure the Section would endorse what had been said about Macewen's operation being the best one but he could not sit down without expressing the very great pleasure he felt at the manner in which the other gentlemen had given up what he might call their pet operations. Professor Oxyton had done this with the greatest possible grace and he Mr Bryant was sure the Section would award him and the others a vote of thanks for the manner in which they had acted.

It is surely given to few men to achieve such a complete international triumph.

I have mentioned that Macewen's monograph dealt also with the causation of the malady which led to the deformities and it may be said that though his views on the etiology of rickets necessarily did not deal with or even foreshadow the more modern views on the biochemical and other agencies to which many now ascribe the production of rickets yet his conclusions as to the influence of bad hygiene the want of pure air the absence of sunshine the effects of chronic ailments and perhaps of epidemic diseases acting during the growth period are still worthy of consideration even in the light of modern knowledge.

The Surgery of the Brain and Spinal Cord

Macewen undoubtedly achieved his greatest fame as the pioneer of brain surgery.

At the meeting of the British Medical Association in Glasgow in 1888 he gave by request an address which has become historic. It was so remarkable a contribution to surgical knowledge and to the surgical literature of the period that it overshadowed the address of the president of the Surgical Section. Comments in British and foreign medical journals of the period show what a sensation was produced throughout the world, and the references to it in the lay press were equally enthusiastic. I am just old enough to remember something of the sensation it caused though my impressions

were derived then solely from perusal of the daily papers.

The *British Medical Journal* referred to it as in many respects the most remarkable contribution to surgical literature which the present day has produced. The journal went on to give extracts from the address singling out some of the most striking details and continuing thus:

With these samples of Dr Macewen's address our readers will not think us extravagant in saying that it marks an epoch in surgery the initial stage of a branch of our art obviously destined to a glorious and beneficent future. All honour to the surgeon who has so ably and successfully led the way in this grand and daring.

After his address Dr William Macewen gave a demonstration of cases so remarkable that it alone would suffice to render the Glasgow meeting memorable in the annals of surgery. Many of the patients whose cases had been described in the address were present.

No wonder that at the close of the meeting there was a scene of enthusiasm such as lived in the memory of all who were privileged to be present. The address was entitled 'On the Surgery of the Brain and Spinal Cord' (4).

Thirty-four years later when the British Medical Association again met in Glasgow in 1922 Macewen now its President took as the subject of his presidential address practically the same theme as in the address of 1888. The title on this occasion was 'Brain Surgery' (13). He was able to show how his observations and conclusions of so many years ago had stood the test of time and he dealt at considerable length with some of the problems of further advance. He stressed the importance of careful observation the paramount necessity of attention to detail even the smallest detail in the investigation of cerebral lesions. He had dealt with this subject in his original address he returned to it again and illustrated what he had to say in this connection by many striking examples. His presidential address was in fact a comprehensive survey of his own work during the 34 years that had elapsed but it was more than that. It was a masterly survey also not only of the more recent developments in the surgery of the brain but of the great possibilities of the future.

It may be of some interest to consider briefly what were the steps by which Macewen's great work on brain surgery came to be suggested and rendered possible. He has himself supplied the clue. In his original address, he said:

The full force and significance of the experiment of Liston and Litzon in 1850 were not recognized until Ferrius observations on the brains of animal (monkey) undertaken to put to experimental proof the views entertained by Hughlings Jackson were published in 1873. Another link in the unity of the plan of creation was

manifest, as even in the higher and more complex brain of man parts existed whose functions found homologous expression in that of the lower animal.

The sequence of events, looked at from the point of view of historical scientific development may be summarized at slightly greater length, thus I quote from my presidential address to the Royal Medico Chirurgical Society of Glasgow in 1924 (49)

The development of exact anatomy, the equally important development of the science of pathology, the progressive growth of physiology from Harvey (1578-1656) to Haller (1708-1777), the modern science of histology which may be said to have been founded by Bichat, who died in 1802 at the early age of 31, the work of Schleiden and Schwann on cellular physiology (1837 and 1838), the correlation of all these and of many other factors led directly or indirectly to the epoch making advance of the science of cranial surgery in the latter part of the nineteenth century.

The introduction of the ophthalmoscope by von Helmholz in 1849, the first accurate proof of cerebral localization by Broca in 1861 when he demonstrated *postmortem* a lesion of the third left frontal convolution in a man who had not been able to speak for 12 years, the pioneer lectures of Hughlings Jackson (1835-1911) on the *Diagnosis of Tumours of the Brain* (12), Jackson's classical papers on *Epilepsy* and on *Affections of Speech* (on a rare demonstration of the association of optic neuritis with cerebral tumour (46), the marking out by Fritsch and Hitzig in 1870 of certain centres in the brain by electrical stimulation (9), the classical experimental work of Ferrier on the brains of monkeys by which he proved beyond question the localization of function in the cerebral cortex, his demonstration at the International Medical Congress in 1881 of two monkeys on whose cerebral cortex experimental injuries had been inflicted, one monkey having a characteristic cerebral hemiplegia while the other had lost its hearing, these finally proved beyond all doubt that cerebral function and indeed the function of the whole cerebro-pinal system were localized and localisable. Further experimental research and the micro-copical investigations and staining methods of Clarke, Marchi, Golgi and others but completed and amplified the evidence.

I have outlined only a few of the most signal discoveries—many more might have been cited—which stand out as mile stones in the path of the great advance in cranial surgery in the last century. One might change the metaphor and say that they represent successive rungs in the ladder of growing knowledge which made possible the later triumphs. They led up to and made possible the famous work of Macewen, Horsley, Bergmann, Keen, Cushing, Ballance and others. Horsley like Ferrier did much experimental work himself. The results of some of his earliest experimental work he reported in a paper he read at Brighton in 1886 (10) in which he described a number of cerebral cases and correlated the diagnosis in each case with his experimental work on the brain of the monkey. A year later he described ten cases—examples of cerebral surgery—

and elaborated the importance of experimental physiology (11).

Macewen in his great address at Glasgow, in 1888 gave an account of twenty-one cases of cerebral lesion, operated on with only three deaths. While the success of the operative record was remarkable, perhaps the most outstanding feature of the address and demonstration was the account of the accurate correspondence of functional disturbance and clinical signs and symptoms with the operation findings.

It has been suggested sometimes that Horsley's work took precedence of Macewen's, that, in fact, Macewen was not the pioneer. But such a claim cannot be supported. Percy Sargent has pointed out (44)

He (Macewen) had indeed been called the father of brain surgery for his early work antedated by several years that of Victor Horsley. In an obscure corner of the *British Medical Journal* of December 18, 1891 it is recorded that Macewen showed before the Glasgow Pathological and Clinical Society two patients upon whom he had successfully operated in the one case for hemiplegia due to a subdural hemorrhage and in the other for a tumour in the left frontal region. This second case is fully recorded in the *Glasgow Medical Journal* of September 1891. It concerned a girl fourteen years of age from whom a supra-orbital periosteal tumour had been removed twelve months previously. The tumour recurred and convulsions appeared which involved the right face and limbs. Macewen trephined in the left frontal region and found the bone to be thick and soft whilst beneath it lay a soft flattened gummatous tumour of the dura mater similar to the tumour lying on the outer surface of the bone. The tumour was removed. No bad symptoms followed the operation and the paralysis disappeared. It is almost certain that this tumour would now be recognized as a meningeal endothelioma.

Horsley and Macewen were undoubtedly great co-workers in the early development of brain surgery. In a sense they might be regarded as rivals, but this rivalry I am confident was less in their own minds than in the minds of their respective supporters. I believe that each would have been concerned less in claiming for himself priority over the other than in acknowledging the great debt that both owed to those who like Hughlings Jackson, Fritsch, Hitzig and Ferrier had made the way clear.

Great as was Macewen's work on the surgery of brain tumors and their localization, he stands out even more clearly as the pioneer in the diagnosis and surgical treatment of intracranial suppurative conditions. He was fortunate, at a very early period in his career, in being brought into association with the work of the late Dr. Thomas Barr of Glasgow, particularly at the Ear Hospital, and as always he took full advantage of the opportunities presented there through this association,

to study in all its bearings the manner of development of the different types of intracranial spread of infection from ear disease. This study became a matter of absorbing interest to him all the more as fresh light began to be cast on the manner of infective spread and on the possibilities of its prevention and its surgical treatment.

The association of Barr with Macewen—it is perhaps the only example in Macewen's career of something approaching the spirit of co-operation—was one of the most fortunate and most fruitful associations in the history of modern surgery, for it led to the laying of the groundwork of most of our present day knowledge on the subject and of present day procedure in the operative treatment of intracranial abscess, meningitis and sinus thrombosis.

Macewen's classic work on *Pyogenic Diseases of the Brain and Spinal Cord* was published in 1893 ('8) and as I have said it remains a standard work today. In virtue of its style, the methodical recording of the cases described in its pages, the reliability of the observations detailed and the comprehensive survey which it takes it has few rivals in modern surgical literature. It suggests better perhaps than any other of Macewen's writings the scientific genius of its author. It is hardly too much to say that the surgical teaching and practice of today in respect of pyogenic intracranial disease and its treatment are mainly based upon and indeed in great measure synonymous with the doctrine first laid down in comprehensive form in this great work.

Well might Sir William Osler say (39)—a *great tribute*—A most important one might almost say essential factor in the successful treatment of intracranial suppuration is an intelligent knowledge on the part of the surgeon of the work and works of William Macewen.

Macewen as an Operator

Very brief reference may be made to Macewen's powers as an operator. One would not claim that he was naturally dexterous or that he was an operator heaven born. He was indeed slower and more deliberate than many surgeons of his day. In his operative work he seldom troubled himself about the matter of time and there were occasions when those of us who worked with him were inclined to regret that he would not hurry just a little. As Patrick has said (40) he aimed at thoroughness rather than speed and dexterity. It is not likely that he had any use for the American phrase "Get in quick and get out quicker."

It is quite certain that in certain branches of surgery Macewen had perhaps less than the

average facility and less than the average success but in those branches of the art which he had done so much to advance and in which he was the unrivaled master he was *facile princeps*.

To see Macewen do a mastoid operation to watch him perform a radical cure of hernia according to the method which he himself devised, to witness a supracondylar osteotomy of the femur done by him for genu valgum was to witness a finished work of art—a thing never to be forgotten.

Macewen as a Teacher

With his appointment to the Regius Chair of Surgery in the University of Glasgow Macewen turned his mind seriously to the duties of teaching. By this time what one may speak of as his creative period had been passed though in such a man the spirit of inquiry and research inherent in his being could never be actually quenched. Nor was it. He continued to the end imbued with the spirit of inquiry and did not cease his investigations. But he put his professional duties always first and did everything in his power to implement the new responsibilities that he had undertaken. He spent much time and labor in preparation for his class work, took great trouble, and expended much ingenuity in the construction of diagrams and models for teaching purposes and he succeeded in making a deep impression on the teaching of surgery in Glasgow an impression whose influence was felt far beyond the University.

Macewen was not a great teacher of systematic surgery. His *milieu* was as a teacher of clinical surgery. I have heard him say long ago that it had been his ambition to establish a great clinical school like the school of the great Kocher of Berne. And indeed there was a certain similarity of method in the clinical teaching of these two men. Each was accustomed to go very fully into the differential diagnosis of his cases in the presence of large classes of students. As each successive case was dealt with two or three students were selected brought down to the floor of the class room and taken very closely over the details of the case. They were quizzed often somewhat rigorously but seldom unmercifully by the chief. All the most likely possibilities were explored and argued out in the presence of the class—to the interest and often to the amusement of the latter but certainly to their enlightenment—until by a process of exclusion the most likely diagnosis was arrived at.

It must be confessed that at the end it did not always happen that Macewen would declare his

own diagnosis in the case. One was often left in doubt as to what Macewen's diagnosis actually was. In this respect Kocher was different. He was accustomed to declare his opinion. Then followed, in the case of Kocher, the inevitable question "*Was sollen Sie thun?*" Macewen often left this out. He was concerned more to show the student how to arrive at a diagnosis, than in forcing from him a declaration as to treatment. But, in any case, those mornings in the clinic were unforgettable, and Macewen's students had certainly little excuse for failure to become proficient in the art of diagnosis.

I have spoken already of the spirit of healthy doubt which he was accustomed to instill into the minds of his students and of his constant injunction to them to put to themselves the perpetual interrogative. That may be said almost to symbolize his principle of instruction,—to make the student think for himself.

Reading Sir Berkeley Moynihan's description of Murphy as a teacher and lecturer, I cannot help feeling that there must have been a certain similarity between Murphy and Macewen in respect of their lack of many of the graces of speech, a lack that was wonderfully atoned for by this same faculty of making those who listened to their words think for themselves. It must very seldom have happened that a listener to either of these great men was sent away without some new thought, some new idea, perhaps some suggestion of a new line of investigation.

I am reminded of a remark of Matthew Arnold which seems apposite. You will find it in his volume on *Culture and Anarchy* (i). He is contrasting the oratory of Pericles with that of Socrates.

"Pericles was perhaps the most perfect speaker who ever lived for he was the man who most perfectly combined thought and wisdom with feeling and eloquence. Yet Plato brings in Alcibiades declaring that men went away from the oratory of Pericles saying it was very fine it was very good and afterwards thinking no more about it. But they went away from hearing Socrates talk he says with the point of what he had said sticking fast in their minds and they could not get rid of it."

In this sense, it seems to me, the teaching of both of these great men, Murphy and Macewen, must have had something of the fruitfulness of the Socratic method of instruction to which Matthew Arnold refers.

Macewen was very jealous of the Scottish methods of teaching the student, and of training the young surgeon. He viewed with disfavor any attempt to graft the English tradition in teaching upon that in force in the Scottish schools. He was a strong protagonist for the teaching of operative

surgery, as a part of general surgery, and he succeeded, not without encountering considerable opposition at first, in obtaining a well-equipped department for the prosecution of the practical part of his operative surgery course, as well as for the purposes of research.

His aspirations for the school of surgery of which he was the official head were ever of the highest. He would never have been content to see it assigned a place less than the highest. I remember hearing him, on one occasion, address the then inspector of anatomy—at a time when the supply of material for the use of teachers of anatomy and surgery had become much restricted and when it was being suggested that the claim of the operative surgery department should give place to that of the anatomy department—in these words: "But, Sir, surely you do not wish to reduce the Glasgow School of Surgery to the level of the X-Schools?" This question may be taken as typifying or epitomizing his aspiration for the Glasgow school—"αλλ' απιστεύω!"—(I refuse to believe best).

Macewen and His Assistants

as we saw him in hospital could not fail to be struck by the apparent incongruity of our conception of the great man with the spectacle we had of him reading a fairy tale to a small child seated on his knee.

I have spoken of the 'something wanting' Job has said (xxviii 9) that 'Great men are not always wise. Of no one probably is such a saying more true than it was of Macewen. Like many great men he was not without the defects of his great qualities. He failed just where he ought to have succeeded. He earned respect he excited admiration. He gave by his energy his industry, his originality of thought his brilliant research an example for all to strive after. It is extremely doubtful however if he ever could be said to have gained or even if he ever desired to gain the affection of those who were his most loyal helpers. Many of us who were brought into close relationship with him and with his work often felt this as a defect in his quality which was to be regretted all the more that such affection could so easily have been his. Macewen would have been none the less great but surely greater had the general admiration and respect accorded to him been supplemented by a general feeling of affectionate regard.

I had occasion some time ago to speak to a friend whose opinion I value regarding the place which Macewen might be held to occupy in respect of his personal qualities in comparison with Lister and Paget. My friend whose name for obvious reasons I withhold said 'I had the privilege of knowing well both Lister and Paget. Macewen did not reach their level. I think though he was a great man. When I met Lister or Paget in consultation or when either of them was examining a microscopical specimen of mine they always gave me the impression that they desired to learn from me.' Now this appears to me the ideal way of encouragement for a really great man to treat a very junior person belonging to the same profession. I may be wrong but I cannot visualise Macewen acting in this way.

It must be admitted that there is much of truth in this criticism but Macewen's defects such as they were only serve to bring into more marked relief the greater qualities of the man whose genius was dedicated for so long to the service of the University of Glasgow and of the great surgical school of which he was the head.

Macewen and the University

On the Professional Roll of the University of Glasgow are inscribed the names of many famous sons of many who have done notable work for the

advancement of knowledge and for the benefit of the whole human race. The traditions of well nigh four hundred years cluster around names almost too numerous to mention of men who in their day and generation have done much to advance the efficiency and repute of their Alma Mater. In the long and distinguished Roll few names can rival probably none can outshine, those of the immortal Lister or of his great disciple Macewen.

A good many years ago in a short memorial sketch of von Mikulicz which I contributed to the *Glasgow Medical Journal* (47) I told the story culled from the columns of the *Frankfurter Zeitung* of June 17 1903 of the great Billroth who when overwhelmed by the great numbers of patients seeking his professional advice some of whom came from Krakau (where Mikulicz a pupil of Billroth was then professor of surgery) turned on them and cried 'Why do you come to me? Have you not Mikulicz in Krakau? He understands his business quite as well as I and operates still better.

There surely was generous tribute from great master to great pupil.

I am reminded of this tale by the following story recently related by one who used to be well known in Glasgow.

A good many years ago I met five English men on the steamer between Hamburg and Leith. They had graduated in medicine in London and had been afterwards in Berlin with Professor Bergmann for a session of post graduate study. When they parted from Bergmann he said to them — 'If you can spare the time I would advise you to go to Glasgow to Professor Macewen for a session. Afterwards no man can teach you more.

There surely was generous tribute from great surgeon to his great international rival.

It cannot be denied that in the possession of Macewen the University and City of Glasgow were richly endowed by Fortune. The name and reputation of Glasgow and of surgery in Glasgow were held in high honor by all who knew Macewen and his work. His clinic was visited by surgeons from all the world who came to see his work for themselves and to listen to his words. At one time indeed he was almost better known abroad than at home—such is the proverbial fate of the prophet. It was certainly so in his case. It is of interest to recall that it was much the same in the case of Lister. Indeed especially in the earlier years of his work at King's College London Lister had to contend with more than mere ignorance and apathy on the part of students and

professional colleagues in London, he had to encounter much opposition, even spiteful opposition. But at least such apathy and ignorance toward his revolutionary work did not extend to foreigners, who, almost from the first, used to crowd the benches day after day, in his lecture theater so much so, indeed, that the few regular students were apt to be crowded out, and ultimately made complaint about it.

Abroad, the name of Macewen was well known. It was one to conjure with. I found it so, when, in my earlier years after graduation, I was able to visit a number of the most famous continental clinics. A card of introduction from Macewen did much to smooth my way. His name was a sort of "Open Sesame" everywhere. Then it was that I realized, if never adequately before, how big a man we were privileged to have at the head of the Glasgow School of Surgery.

I have wondered, sometimes, whether Glasgow has ever fully appreciated its great good fortune in the possession of Macewen, or how nearly, on more occasions than one, the school came to losing him.

It is no secret that Macewen was invited on more than one occasion, to accept appointment elsewhere—notably when he was urged, very strongly and persistently, to join the great School of the Johns Hopkins University at Baltimore. All kinds of lures were held out to him, to induce him to go there, but he declined and persisted in his decision to remain in Glasgow.

In an intitled memorial contribution to the *British Medical Journal*, of date March 29, 1924 (13) the story of this attempt to lure Macewen to Baltimore is told. The account may be somewhat highly colored, but there is reason to believe that, in its main facts it is substantially correct. The following is a brief outline of the story. When the Johns Hopkins School was being established, those in control searched the world for men of outstanding ability in research or in teaching capacity. Macewen was invited to join the staff, but declined appointment. It was made clear that salary was no object, and that a great practice awaited him. He declined. He was told that the surgical wards to be built would be erected to suit his wishes. He still declined. He was then invited to bring with him, up to any reasonable number, assistants and nurses. Still he declined. Finally he was invited to take a long holiday, to come over to Baltimore, and, incidentally, to advise about the establishment of the new School, suitable remuneration being promised. Even this attractive offer failed to induce him to leave Glasgow, and that was the end of the project.

It would be idle to suppose that such an invitation was not a considerable temptation, even as it was a very high compliment to Macewen. It came to him, however, just at the time when he was busy with his great work on *Pyogenic Diseases of the Brain and Spinal Cord* and with the preparation of his *Atlas of Head Sections*, to which reference was made in the earlier part of this address. It reached him, therefore, during the exceedingly busy 5 years following the delivery of his address on *The Surgery of the Brain and Spinal Cord*. No doubt he felt that it was impossible for him to interrupt his great work at such a time.

The circumstances of the situation, and the decision to which Macewen then came remind one of the reply of Nehemiah, to those who urged him to go down to commune with them without the wall which he was engaged in building—"And I sent messengers unto them, saying, I am doing a great work, so that I cannot come down, why should the work cease whilst I leave it and come down to you?" (Nehemiah vi, 3). Baltimore's loss was surely Glasgow's gain.

Shortly after the death of Macewen steps were taken in Glasgow by a committee of which I had the honor to be Hon. Secretary to establish a fund, the purpose of which should be to initiate a memorial of his life and work. That fund has been obtained and the conditions of its application are now finally determined. The first purpose of the fund was the obtaining of a memorial bust, in bronze. This bust by Paulin, has been made, and has been formally handed over to the custody of the University, a replica being presented to Lady Macewen. The second purpose of the fund has been arranged for in the provision of a medal, to be awarded to the most distinguished student in surgery of each year. The first award has still to be made. The third and perhaps the most important purpose of the fund, it was decided should be the establishment of a Macewen Memorial Lectureship. The appointment of Lecturer will fall to be made by the University Court acting on the advice of a small committee of three. The Memorial Lecture according to the terms of the foundation, may deal with any subject bearing on the advancement of surgical science. It may be of interest to state that the Inaugural Macewen Memorial Lecture is to be delivered next year by your countryman, and former President, I think, Professor Harvey Cushing.

But, after all, we shall remember Macewen not so much in virtue of artificial aids of such a kind. In the words of the editor of *The Medical Journal of Australia* (6), speaking of Macewen

"Great men are remembered more by the fruits of their work than by monuments erected by their contemporaries"

So we remember with gratitude the life and work of William Macewen. The fruits of his work are with us and are known to us

I his humble successor commend to you his great memory

REFERENCES

- 1 ARNOLD MATTHEW Culture and Anarchy Conclu
sion 1869
- 2 BALLANCE The History of the Surgery of the Brain
1922
- 3 Idem Obituary tribute to Macewen Brit M J
1924 March 29
- 4 CHENE Discussion on Chene's operation for genu
valgum Edinburgh M J 1899 6, 1 May
- 5 DUNCAN Memorials of the Faculty of Physicians
and Surgeons Glasgow 1897 p 13
- 6 Editorial The Macewen memorial M J Australia
1923 May 23
- 7 FERRIER Experimental researches in cerebral physi
ology and pathology West Riding Lunatic Asylum
Rep 1833 iii 30
- 8 FINLAYSON JAMES Account of the Life and Works of
Maister Peter Lowe 1889
- 9 FRITSCH and HITZIG Leber die elektrische Erregbar
keit des Grosshirns Du Bois Reymond's Archives
1890 300
- 10 HORSLEY Brain surgery Brit M J 1886 ii 60
- 11 Idem Remarks on ten consecutive cases of operations
upon the brain Brit M J 1884 i 803
- 12 HUTCHINGS JACKSON Diagnosis of tumors of the brain
Med Times & Gaz 1884 ii 130 295 31
- 13 J M Obituary tribute to Macewen Brit M J 1924
March 29
- 14 LAURIE and KING Statistics of injuries of the head
Lond & Edinb J M Sci 1844 April
- 15 MACALISTER Memorial address at the Glasgow Hospital
(Glasgow M J 1925 July)
- 16 MACEWEN SIR WILLIAM Penetrating wound of
thorax and abdomen Glasgow M J 1853 ns
vii 1
- 17 Idem Wounds in relation to the instruments which
produce them Glasgow M J 1856 ns viii 28
- 18 Idem The diagnosis of alcoholic coma Glasgow M J
1859 ii 1
- 19 Idem Antiseptic osteotomy for genu valgum genu
varum and other osseous deformities Lancet 1855
December 9 189 April 56
- 20 Idem Osteotomy an inquiry into the Etiology and
Pathology of Knock Knee Bow Leg and Other
Osseous Deformities of the Lower Limbs 1850
- 21 Idem Chronic gut its method of preparation and
behavior in living tissues Ann Anat & Surg 1881
ii 19
- 22 Idem Observations concerning transplantation of
bone Illustrated by a case of interhuman osseous
transplantation whereby over two thirds of the
shaft of a humerus was restored Proc Roy Soc
Lond 1881 xxxv 232
- 23 Idem The osteogenic factors in the development and
repair of bone Ann Surg 1882 vi 289 389
- 24 Idem On the surgery of the brain and spinal cord
Brit M J 1888 ii 302
- 25 Idem Articles on various subjects Dictionary of
Practical Surgery by Christopher Heath 3d ed
1839
- 26 Idem On aneurism its cure by inducing the forma
tion of white thrombi within the ac Brit M J
1890 ii 1107 and 1164
- 27 Idem Introduction to a discussion on anæsthetics
(Glasgow Med Chir Soc 1890) Glasgow M J
1890 xxxiv 322 also concluding remarks on an
æsthetics (same discussion) Glasgow M J 1890
xxxv 32
- 28 Idem Iogenic Diseases of the Brain and Spinal Cord
1893
- 29 Idem The surgery of the lungs Lancet 1902 ii 1329
- 30 Idem Some points on the surgery of the lung (Caven
dish lecture) Brit M J 1906 ii 1
- 31 Idem The Growth of Bone Observations on Osteo
genesis and an Experimental Inquiry into the Develop
ment and Reproduction of Diaphyseal Bone 1912
- 32 Idem Intrathoracic surgery (17th Internat Cong
Med Lond 1913) Lancet 1913 ii 551
- 33 Idem Brain surgery Presidential address British
Medical Association Glasgow 1922 Brit M J
1923 ii 125
- 34 Idem The physics of the lungs and pleura (Austral
Med Cong 1923) Brit M J 1924 i 71
- 35 MACEWEN and Others Osteotomy for genu valgum
Discussion at Copenhagen 1884 Tr Cong In
ternat d Sci Méd Copenhagen 1886 ii 72
- 36 MCCREGOR and OBERSTON Obituary tribute to Mac
ewen Lancet 1924 March 29
- 37 MOYMAN SIR BERKELEY John B Murphy Surgeon
Surg Gynec & Obst 1920 31 549
- 38 OOSTER Operative treatment of genu valgum Edin
burgh M J 1877 82 March
- 39 OSLER The Principles and Practice of Medicine
6th ed 1903 p 997
- 40 IATRICK Obituary tribute to Macewen Glasgow
M J 1924 April
- 41 IRINGE Obituary tribute to Macewen Brit M J
1924 March 29
- 42 RUSKIN War Crown of Wild Olive Lecture III
(Delivered at the Royal Military Academy Wool
wich 1863)
- 43 Idem Athena in the Heart The Queen of the Air
Lecture III 1869
- 44 SARGENT Obituary tribute to Macewen Brit M J
1924 March 29
- 45 THOMSON SIR ST CLAIR A short surgeon's memoirs
of Joseph Lister Ann Med Hist 1910 ii No 2
- 46 VON GRAEFEL Ueber Complication von Sehnenver
wundung mit Gehirnerkrankheiten Arch f Ophthal
1860 vi 53
- 47 VON GRAEFEL Obituary tribute to von Mikulicz Glasgow
M J 1905 August
- 48 Idem Traditions of the Pegasus Chair of Surgery in the
University of Glasgow Inaugural Address 1924
October 15
- 49 Idem The limitations of surgery Presidential address
Ioy Med Chir Soc Glasgow 1924 October Glas
gow M J 1924 November
- 50 Idem Sir William Macewen An Oration delivered
in the University of Glasgow at the commemoration
of benefactors June 3 1926 Glasgow University
Publications ii

